Fish and Wildlife Service
P. O. Box 3830, Honolulu, T. H.

THE AMERICAN NAUTICAL ALMANAC

FOR THE YEAR

1956

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UNITED STATES NAVAL OBSERVATORY
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D.C.

STARS

NAME	MAG.	NO.
Acamar	3.1	7
Achernar	0.6	5
Acrux	1.1	30
Adhara	1.6	19
Aldebaran	1.1	10
Alioth	1.7	32
Alkaid	1.9	34
Al Na'ir	2.2	55
Alnilam	1.8	15
Alphard	2.2	25
Alphecca	2.3	41
Alpheratz	2.2	1
Altair	0.9	51
Ankaa	2.4	2
Antares	1.2	42
Arcturus	0.2	37
Atria	1.9	43
Avior	1.7	22
Bellatrix	1.7	13
Betelgeuse	0.1 to 1.2	16
Canopus	−0.9	17
Capella	0.2	12
Deneb	1.3	53
Denebola	2.2	28
Diphda	2.2	4
Dubhe	2.0	27
Elnath	1.8	14
Eltanin	2.4	47
Enif	2.5	54
Fomalhaut	1.3	56
Gacrux	1.6	31
Gienah	2.8	29
Hadar	0.9	35
Hamal	2.2	6
Kaus Australis	2.0	48
Kochab	2.2	40
Markab	2.6	57
Menkar	2.8	8
Menkent	2.3	36
Miaplacidus	1.8	24
Mirfak	1.9	9
Nunki	2.1	50
Peacock	2.1	52
Pollux	1.2	21
Procyon	0.5	20
Rasalhague	2.1	46
Regulus	1.3	26
Rigel	0.3	11
Rigil Kentaurus	0.1	38
Sabik	2.6	44
Schedar	2.5	3
Shaula	1.7	45
Sirius	−1.6	18
Spica	1.2	33
Suhail	2.2	23
Vega	0.1	49
Zubenelgenubi	2.9	39

CORRECTIONS TO OBSERVED ALTITUDES

STARS AND PLANETS

Obs. Alt.	corr'n	Obs. Alt.	corr'n
° ′	′	° ′	′
4 23	−10.9	9 44	−5.4
4 26	−10.8	9 56	−5.3
4 29	−10.7	10 08	−5.2
4 32	−10.6	10 20	−5.1
4 36	−10.5	10 33	−5.0
4 39	−10.4	10 46	−4.9
4 42	−10.3	11 00	−4.8
4 46	−10.2	11 14	−4.7
4 49	−10.1	11 29	−4.6
4 53	−10.0	11 45	−4.5
4 56	− 9.9	12 01	−4.4
5 00	− 9.8	12 18	−4.3
5 04	− 9.7	12 35	−4.2
5 08	− 9.6	12 54	−4.1
5 12	− 9.5	13 13	−4.0
5 16	− 9.4	13 33	−3.9
5 20	− 9.3	13 54	−3.8
5 24	− 9.2	14 16	−3.7
5 28	− 9.1	14 40	−3.6
5 32	− 9.0	15 04	−3.5
5 37	− 8.9	15 30	−3.4
5 41	− 8.8	15 57	−3.3
5 46	− 8.7	16 26	−3.2
5 51	− 8.6	16 56	−3.1
5 55	− 8.5	17 28	−3.0
6 00	− 8.4	18 02	−2.9
6 05	− 8.3	18 38	−2.8
6 11	− 8.2	19 17	−2.7
6 16	− 8.1	19 58	−2.6
6 21	− 8.0	20 42	−2.5
6 27	− 7.9	21 28	−2.4
6 32	− 7.8	22 19	−2.3
6 38	− 7.7	23 13	−2.2
6 44	− 7.6	24 11	−2.1
6 50	− 7.5	25 14	−2.0
6 56	− 7.4	26 22	−1.9
7 03	− 7.3	27 36	−1.8
7 09	− 7.2	28 56	−1.7
7 16	− 7.1	30 24	−1.6
7 23	− 7.0	32 00	−1.5
7 30	− 6.9	33 45	−1.4
7 37	− 6.8	35 40	−1.3
7 44	− 6.7	37 48	−1.2
7 52	− 6.6	40 08	−1.1
8 00	− 6.5	42 44	−1.0
8 08	− 6.4	45 36	−0.9
8 16	− 6.3	48 47	−0.8
8 25	− 6.2	52 18	−0.7
8 34	− 6.1	56 11	−0.6
8 43	− 6.0	60 28	−0.5
8 52	− 5.9	65 08	−0.4
9 02	− 5.8	70 11	−0.3
9 12	− 5.7	75 34	−0.2
9 23	− 5.6	81 13	−0.1
9 33	− 5.5	87 03	0.0
9 44		90 00	

SUN'S LOWER LIMB

Obs. Alt.	corr'n	Obs. Alt.	corr'n
° ′	′	° ′	′
4 22	+ 4.9	9 39	+10.4
4 25	+ 5.0	9 51	+10.5
4 28	+ 5.1	10 03	+10.6
4 31	+ 5.2	10 15	+10.7
4 34	+ 5.3	10 27	+10.8
4 37	+ 5.4	10 40	+10.9
4 41	+ 5.5	10 54	+11.0
4 44	+ 5.6	11 08	+11.1
4 48	+ 5.7	11 23	+11.2
4 51	+ 5.8	11 38	+11.3
4 55	+ 5.9	11 54	+11.4
4 58	+ 6.0	12 10	+11.5
5 02	+ 6.1	12 28	+11.6
5 06	+ 6.2	12 46	+11.7
5 10	+ 6.3	13 05	+11.8
5 14	+ 6.4	13 24	+11.9
5 18	+ 6.5	13 45	+12.0
5 22	+ 6.6	14 07	+12.1
5 26	+ 6.7	14 30	+12.2
5 31	+ 6.8	14 54	+12.3
5 35	+ 6.9	15 19	+12.4
5 39	+ 7.0	15 46	+12.5
5 44	+ 7.1	16 14	+12.6
5 49	+ 7.2	16 44	+12.7
5 53	+ 7.3	17 15	+12.8
5 58	+ 7.4	17 48	+12.9
6 03	+ 7.5	18 24	+13.0
6 08	+ 7.6	19 01	+13.1
6 13	+ 7.7	19 42	+13.2
6 19	+ 7.8	20 25	+13.3
6 24	+ 7.9	21 11	+13.4
6 30	+ 8.0	22 00	+13.5
6 35	+ 8.1	22 54	+13.6
6 41	+ 8.2	23 51	+13.7
6 47	+ 8.3	24 53	+13.8
6 53	+ 8.4	26 00	+13.9
7 00	+ 8.5	27 13	+14.0
7 06	+ 8.6	28 33	+14.1
7 13	+ 8.7	30 00	+14.2
7 19	+ 8.8	31 35	+14.3
7 26	+ 8.9	33 20	+14.4
7 34	+ 9.0	35 17	+14.5
7 41	+ 9.1	37 26	+14.6
7 49	+ 9.2	39 50	+14.7
7 56	+ 9.3	42 31	+14.8
8 04	+ 9.4	45 31	+14.9
8 13	+ 9.5	48 55	+15.0
8 21	+ 9.6	52 44	+15.1
8 30	+ 9.7	57 02	+15.2
8 39	+ 9.8	61 51	+15.3
8 48	+ 9.9	67 17	+15.4
8 58	+10.0	73 16	+15.5
9 08	+10.1	79 43	+15.6
9 18	+10.2	86 32	+15.7
9 28	+10.3	90 00	
9 39			

HEIGHT OF EYE

Feet	corr'n	Feet	corr'n
	′		′
1.0	−1.0	46	− 6.5
1.2	−1.1	47	− 6.6
1.4	−1.2	49	− 6.7
1.7	−1.3	50	− 6.8
2.0	−1.4	52	− 6.9
2.3	−1.5	53	− 7.0
2.6	−1.6	55	− 7.1
3.0	−1.7	56	− 7.2
3.4	−1.8	58	− 7.3
3.8	−1.9	60	− 7.4
4.2	−2.0	61	− 7.5
4.6	−2.1	63	− 7.6
5.1	−2.2	65	− 7.7
5.5	−2.3	66	− 7.8
6.1	−2.4	68	− 7.9
6.6	−2.5	70	− 8.0
7.2	−2.6	72	− 8.1
7.8	−2.7	74	− 8.2
8.4	−2.8	75	− 8.3
9.0	−2.9	77	− 8.4
9.6	−3.0	79	− 8.5
10.3	−3.1	81	− 8.6
11.0	−3.2	83	− 8.7
11.7	−3.3	85	− 8.8
12.4	−3.4	87	− 8.9
13.2	−3.5	89	− 9.0
14.0	−3.6	91	− 9.1
14.8	−3.7	93	− 9.2
15.6	−3.8	95	− 9.3
16.4	−3.9	97	− 9.4
17.3	−4.0	99	− 9.5
18.2	−4.1	101	− 9.6
19.1	−4.2	103	− 9.7
20.0	−4.3	105	− 9.8
21	−4.4	107	− 9.9
22	−4.5	110	−10.0
23	−4.6	112	−10.1
24	−4.7	114	−10.2
25	−4.8	116	−10.3
26	−4.9	119	−10.4
27	−5.0	121	−10.5
28	−5.1	123	−10.6
29	−5.2	126	−10.7
30	−5.3	128	−10.8
31	−5.4	130	−10.9
33	−5.5	133	−11.0
34	−5.6	135	−11.1
35	−5.7	138	−11.2
36	−5.8	140	−11.3
38	−5.9	143	−11.4
39	−6.0	145	−11.5
40	−6.1	148	−11.6
42	−6.2	150	−11.7
43	−6.3	153	−11.8
44	−6.4	156	−11.9
46		158	

When an observed altitude, or the height of eye, corresponds exactly to a printed value, use the upper of the two possible corrections. For Venus, Mars, and the Sun's lower limb, apply also the additional corrections on the daily pages. For the Moon, see back cover. For the Sun's upper limb, and bubble sextant observations, see page 250.

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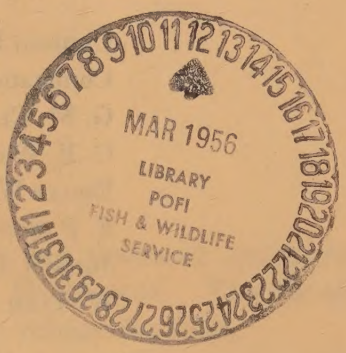
THE AMERICAN NAUTICAL ALMANAC

FOR THE YEAR 1956



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UNITED STATES
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PREFACE

This volume of the *American Nautical Almanac* was prepared under the immediate supervision of G. M. CLEMENCE and R. L. DUNCOMBE. The nature and arrangement of the material are the same as in the volume for 1955.

The object of the volume is to provide in convenient form the astronomical data required by mariners; that is, the Greenwich hour angle and declination of the celestial bodies used in navigation. These can always be found with two openings of the book, one (in the white section) for the hour and the other (in the yellow section) for the minute of observation. Each result is obtained as the sum of two or of three quantities, without interpolation.

The altitude corrections are obtained without interpolation; and the parallax and semidiameter of the Moon are not needed.

An explanation of the use of the *Almanac* is given near the end of the white section. This is followed by a supplementary list of 172 stars and tables for finding the latitude by Polaris.

F. A. GRAF,
Captain, U. S. Navy,
Superintendent Naval Observatory.

WASHINGTON, *April 1954.*

GMT	♈	VENUS −3.4		MARS 1.7		JUPITER −1.9		SATURN 0.8		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
1 0	99 38.0	147 08.5	−19 34.2	230 28.0	−17 32.7	306 01.9	+12 00.0	222 31.1	−17 59.6	319 14.8	87	+10 34.0	−127
1	114 40.5	162 07.8	33.4	245 28.9	33.1	321 04.5	00.1	237 33.3	59.7	333 42.5	88	10 21.3	−128
2	129 42.9	177 07.1	32.6	260 29.7	33.6	336 07.1	00.1	252 35.5	59.7	348 10.3	89	10 08.5	−128
3	144 45.4	192 06.4	·· 31.8	275 30.5	·· 34.0	351 09.6	·· 00.2	267 37.7	·· 59.8	2 38.2	90	· 9 55.7	−128
4	159 47.9	207 05.7	30.9	290 31.3	34.5	6 12.2	00.2	282 39.9	59.8	17 06.2	91	9 42.9	−129
5	174 50.3	222 05.0	30.1	305 32.1	34.9	21 14.8	00.3	297 42.2	59.9	31 34.3	92	9 30.0	−129
6	189 52.8	237 04.4	−19 29.3	320 32.9	−17 35.4	36 17.3	+12 00.3	312 44.4	−17 59.9	46 02.5	93	+ 9 17.1	−130
7	204 55.2	252 03.7	28.4	335 33.7	35.8	51 19.9	00.4	327 46.6	18 00.0	60 30.8	93	9 04.1	−130
8	219 57.7	267 03.0	27.6	350 34.6	36.3	66 22.5	00.4	342 48.8	00.0	74 59.1	94	8 51.1	−130
9	235 00.2	282 02.3	·· 26.8	5 35.4	·· 36.7	81 25.0	·· 00.5	357 51.0	·· 00.1	89 27.5	96	· 8 38.1	−131
10	250 02.6	297 01.6	25.9	20 36.2	37.1	96 27.6	00.5	12 53.2	00.1	103 56.1	95	8 25.0	−131
11	265 05.1	312 00.9	25.1	35 37.0	37.6	111 30.2	00.6	27 55.4	00.2	118 24.6	97	8 11.9	−131
12	280 07.6	327 00.2	−19 24.2	50 37.8	−17 38.0	126 32.8	+12 00.6	42 57.6	−18 00.2	132 53.3	98	+ 7 58.8	−131
13	295 10.0	341 59.5	23.4	65 38.6	38.5	141 35.3	00.7	57 59.8	00.3	147 22.1	98	7 45.7	−132
14	310 12.5	356 58.8	22.6	80 39.5	38.9	156 37.9	00.7	73 02.0	00.3	161 50.9	100	7 32.5	−132
15	325 15.0	11 58.2	·· 21.7	95 40.3	·· 39.4	171 40.5	·· 00.8	88 04.2	·· 00.4	176 19.9	100	· 7 19.3	−132
16	340 17.4	26 57.5	20.9	110 41.1	39.8	186 43.0	00.8	103 06.4	00.4	190 48.9	100	7 06.1	−133
17	355 19.9	41 56.8	20.0	125 41.9	40.2	201 45.6	00.9	118 08.7	00.5	205 17.9	102	6 52.8	−132
18	10 22.4	56 56.1	−19 19.2	140 42.7	−17 40.7	216 48.2	+12 00.9	133 10.9	−18 00.5	219 47.1	102	+ 6 39.6	−133
19	25 24.8	71 55.4	18.3	155 43.5	41.1	231 50.8	01.0	148 13.1	00.6	234 16.3	103	6 26.3	−133
20	40 27.3	86 54.7	17.5	170 44.3	41.6	246 53.3	01.0	163 15.3	00.6	248 45.6	104	6 13.0	−133
21	55 29.7	101 54.0	·· 16.6	185 45.1	·· 42.0	261 55.9	·· 01.1	178 17.5	·· 00.7	263 15.0	105	· 5 59.7	−133
22	70 32.2	116 53.4	15.8	200 46.0	42.4	276 58.5	01.1	193 19.7	00.7	277 44.5	105	5 46.4	−134
23	85 34.7	131 52.7	15.0	215 46.8	42.9	292 01.0	01.2	208 21.9	00.8	292 14.0	106	5 33.0	−133
2 0	100 37.1	146 52.0	−19 14.1	230 47.6	−17 43.3	307 03.6	+12 01.2	223 24.1	−18 00.8	306 43.6	107	+ 5 19.7	−134
1	115 39.6	161 51.3	13.2	245 48.4	43.8	322 06.2	01.3	238 26.3	00.9	321 13.3	107	5 06.3	−134
2	130 42.1	176 50.6	12.4	260 49.2	44.2	337 08.8	01.3	253 28.5	00.9	335 43.0	108	4 52.9	−133
3	145 44.5	191 50.0	·· 11.5	275 50.0	·· 44.6	352 11.3	·· 01.4	268 30.7	·· 01.0	350 12.8	109	· 4 39.6	−134
4	160 47.0	206 49.3	10.7	290 50.8	45.1	7 13.9	01.5	283 33.0	01.0	4 42.7	110	4 26.2	−134
5	175 49.5	221 48.6	09.8	305 51.6	45.5	22 16.5	01.5	298 35.2	01.1	19 12.7	110	4 12.8	−134
6	190 51.9	236 47.9	−19 09.0	320 52.5	−17 46.0	37 19.1	+12 01.6	313 37.4	−18 01.1	33 42.7	110	+ 3 59.4	−134
7	205 54.4	251 47.3	08.1	335 53.3	46.4	52 21.6	01.6	328 39.6	01.2	48 12.7	112	3 46.0	−134
8	220 56.8	266 46.6	07.3	350 54.1	46.8	67 24.2	01.7	343 41.8	01.2	62 42.9	112	3 32.6	−134
9	235 59.3	281 45.9	·· 06.4	5 54.9	·· 47.3	82 26.8	·· 01.7	358 44.0	·· 01.3	77 13.1	112	· 3 19.2	−134
10	251 01.8	296 45.2	05.5	20 55.7	47.7	97 29.4	01.8	13 46.2	01.3	91 43.3	113	3 05.8	−133
11	266 04.2	311 44.6	04.7	35 56.5	48.2	112 32.0	01.8	28 48.4	01.4	106 13.6	114	2 52.5	−134
12	281 06.7	326 43.9	−19 03.8	50 57.3	−17 48.6	127 34.5	+12 01.9	43 50.6	−18 01.4	120 44.0	115	+ 2 39.1	−134
13	296 09.2	341 43.2	03.0	65 58.1	49.0	142 37.1	01.9	58 52.8	01.5	135 14.5	115	2 25.7	−134
14	311 11.6	356 42.5	02.1	80 59.0	49.5	157 39.7	02.0	73 55.1	01.5	149 45.0	115	2 12.3	−133
15	326 14.1	11 41.9	·· 01.2	95 59.8	·· 49.9	172 42.3	·· 02.0	88 57.3	·· 01.6	164 15.5	116	· 1 59.0	−134
16	341 16.6	26 41.2	19 00.4	111 00.6	50.3	187 44.8	02.1	103 59.5	01.6	178 46.1	117	1 45.6	−133
17	356 19.0	41 40.5	18 59.5	126 01.4	50.8	202 47.4	02.1	119 01.7	01.7	193 16.8	117	1 32.3	−133
18	11 21.5	56 39.9	−18 58.6	141 02.2	−17 51.2	217 50.0	+12 02.2	134 03.9	−18 01.7	207 47.5	117	+ 1 19.0	−134
19	26 24.0	71 39.2	57.8	156 03.0	51.7	232 52.6	02.3	149 06.1	01.8	222 18.2	119	1 05.6	−133
20	41 26.4	86 38.5	56.9	171 03.8	52.1	247 55.2	02.3	164 08.3	01.8	236 49.1	118	0 52.3	−133
21	56 28.9	101 37.9	·· 56.0	186 04.6	·· 52.5	262 57.7	·· 02.4	179 10.5	·· 01.9	251 19.9	119	· 0 39.0	−132
22	71 31.3	116 37.2	55.2	201 05.4	53.0	278 00.3	02.4	194 12.7	01.9	265 50.8	120	0 25.8	−133
23	86 33.8	131 36.5	54.3	216 06.2	53.4	293 02.9	02.5	209 15.0	02.0	280 21.8	120	+ 0 12.5	−132
3 0	101 36.3	146 35.9	−18 53.4	231 07.1	−17 53.8	308 05.5	+12 02.5	224 17.2	−18 02.0	294 52.8	121	− 0 00.7	−132
1	116 38.7	161 35.2	52.5	246 07.9	54.3	323 08.1	02.6	239 19.4	02.1	309 23.9	121	0 13.9	−132
2	131 41.2	176 34.5	51.7	261 08.7	54.7	338 10.7	02.6	254 21.6	02.1	323 55.0	121	0 27.1	−132
3	146 43.7	191 33.9	·· 50.8	276 09.5	·· 55.1	353 13.2	·· 02.7	269 23.8	·· 02.2	338 26.1	122	· 0 40.3	−132
4	161 46.1	206 33.2	49.9	291 10.3	55.6	8 15.8	02.8	284 26.0	02.2	352 57.3	122	0 53.5	−131
5	176 48.6	221 32.5	49.0	306 11.1	56.0	23 18.4	02.8	299 28.2	02.3	7 28.5	123	1 06.6	−131
6	191 51.1	236 31.9	−18 48.2	321 11.9	−17 56.4	38 21.0	+12 02.9	314 30.4	−18 02.3	21 59.8	123	− 1 19.7	−131
7	206 53.5	251 31.2	47.3	336 12.7	56.9	53 23.6	02.9	329 32.6	02.4	36 31.1	123	1 32.8	−130
8	221 56.0	266 30.5	46.4	351 13.5	57.3	68 26.2	03.0	344 34.9	02.4	51 02.4	124	1 45.8	−130
9	236 58.5	281 29.9	·· 45.5	6 14.3	·· 57.7	83 28.7	·· 03.0	359 37.1	·· 02.5	65 33.8	124	· 1 58.8	−130
10	252 00.9	296 29.2	44.6	21 15.1	58.2	98 31.3	03.1	14 39.3	02.5	80 05.2	125	2 11.8	−130
11	267 03.4	311 28.6	43.8	36 15.9	58.6	113 33.9	03.1	29 41.5	02.6	94 36.7	125	2 24.8	−129
12	282 05.8	326 27.9	−18 42.9	51 16.8	−17 59.0	128 36.5	+12 03.2	44 43.7	−18 02.6	109 08.2	125	− 2 37.7	−129
13	297 08.3	341 27.2	42.0	66 17.6	59.5	143 39.1	03.3	59 45.9	02.7	123 39.7	126	2 50.6	−129
14	312 10.8	356 26.6	41.1	81 18.4	17 59.9	158 41.7	03.3	74 48.1	02.7	138 11.3	125	3 03.5	−129
15	327 13.2	11 25.9	·· 40.2	96 19.2	·18 00.3	173 44.2	·· 03.4	89 50.3	·· 02.7	152 42.8	127	· 3 16.4	−128
16	342 15.7	26 25.3	39.3	111 20.0	00.8	188 46.8	03.4	104 52.6	02.8	167 14.5	126	3 29.2	−127
17	357 18.2	41 24.6	38.4	126 20.8	01.2	203 49.4	03.5	119 54.8	02.8	181 46.1	127	3 41.9	−128
18	12 20.6	56 24.0	−18 37.6	141 21.6	−18 01.6	218 52.0	+12 03.5	134 57.0	−18 02.9	196 17.8	127	− 3 54.7	−127
19	27 23.1	71 23.3	36.7	156 22.4	02.1	233 54.6	03.6	149 59.2	02.9	210 49.5	127	4 07.4	−126
20	42 25.6	86 22.7	35.8	171 23.2	02.5	248 57.2	03.7	165 01.4	03.0	225 21.2	128	4 20.0	−126
21	57 28.0	101 22.0	·· 34.9	186 24.0	·· 02.9	263 59.8	·· 03.7	180 03.6	·· 03.0	239 53.0	127	· 4 32.6	−126
22	72 30.5	116 21.4	34.0	201 24.8	03.3	279 02.4	03.8	195 05.8	03.1	254 24.7	128	4 45.2	−126
23	87 33.0	131 20.7	33.1	216 25.6	03.8	294 05.0	03.8	210 08.1	03.1	268 56.5	129	4 57.8	−125
24	102 35.4	146 20.1	−18 32.2	231 26.4	−18 04.2	309 07.5	+12 03.9	225 10.3	−18 03.2	283 28.4	128	− 5 10.3	−124
code	−	− 7	+ 8	+ 8	− 4	+ 26	0	+ 22	− 1				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
1 0	179 14.9	−23 06.1	7	Acamar	315 50.7	−40 29.0
1	194 14.6	05.9	5	Achernar	335 58.5	−57 27.8
2	209 14.3	05.7	30	Acrux	173 57.5	−62 51.2
3	224 14.0	05.5	19	Adhara	255 46.0	−28 54.7
4	239 13.7	05.3	10	Aldebaran	291 38.5	+16 25.4
5	254 13.4	05.1				
6	269 13.1	−23 05.0	32	Alioth	166 58.4	+56 11.5
7	284 12.8	04.8	34	Alkaid	153 32.9	+49 31.6
8	299 12.5	04.6	55	Al Na'ir	28 38.0	−47 10.6
9	314 12.2	04.4	15	Alnilam	276 29.7	− 1 13.8
10	329 11.9	04.2	25	Alphard	218 38.1	− 8 28.1
11	344 11.6	04.0				
12	359 11.3	−23 03.8	41	Alphecca	126 47.7	+26 51.5
13	14 11.0	03.6	1	Alpheratz	358 28.1	+28 51.1
14	29 10.7	03.4	51	Altair	62 50.5	+ 8 45.1
15	44 10.4	03.2	2	Ankaa	353 58.1	−42 32.8
16	59 10.1	03.0	42	Antares	113 19.4	−26 20.1
17	74 09.8	02.8				
18	89 09.5	−23 02.6	37	Arcturus	146 35.1	+19 24.4
19	104 09.2	02.4	43	Atria	109 00.4	−68 56.8
20	119 08.9	02.3	22	Avior	234 35.1	−59 22.0
21	134 08.6	02.1	13	Bellatrix	279 17.9	+ 6 18.6
22	149 08.3	01.9	16	Betelg'se	271 47.6	+ 7 24.0
23	164 08.0	01.7				
			17	Canopus	264 14.7	−52 40.3
2 0	179 07.7	−23 01.4	12	Capella	281 37.6	+45 57.4
2 1	194 07.5	01.2	53	Deneb	50 01.3	+45 07.5
2	209 07.2	01.0	28	Denebola	183 17.4	+14 48.9
3	224 06.9	00.8	4	Diphda	349 39.0	−18 13.7
4	239 06.6	00.6				
5	254 06.3	00.4	27	Dubhe	194 44.0	+61 58.9
6	269 06.0	−23 00.2	14	Elnath	279 06.7	+28 34.3
7	284 05.7	23 00.0	47	Eltanin	91 06.7	+51 29.6
8	299 05.4	22 59.8	54	Enif	34 29.6	+ 9 40.5
9	314 05.1	59.6	56	Fomalhaut	16 11.6	−29 51.4
10	329 04.8	59.4				
11	344 04.5	59.2	31	Gacrux	172 48.9	−56 51.9
12	359 04.2	−22 59.0	29	Gienah	176 36.6	−17 17.9
13	14 03.9	58.8	35	Hadar	149 49.3	−60 09.5
14	29 03.6	58.5	6	Hamal	328 49.3	+23 15.5
15	44 03.3	58.3	48	Kaus Aust.	84 41.3	−34 24.4
16	59 03.0	58.1				
17	74 02.7	57.9	40	Kochab	137 18.6	+74 19.8
18	89 02.5	−22 57.7	57	Markab	14 21.4	+14 58.3
19	104 02.2	57.5	8	Menkar	314 59.9	+ 3 55.1
20	119 01.9	57.3	36	Menkent	148 58.5	−36 09.2
21	134 01.6	57.0	24	Miapl'dus	221 48.2	−69 32.1
22	149 01.3	56.8				
23	164 01.0	56.6	9	Mirfak	309 41.7	+49 42.6
			50	Nunki	76 52.0	−26 21.2
3 0	179 00.7	−22 56.4	52	Peacock	54 27.5	−56 52.7
3 1	194 00.4	56.2	21	Pollux	244 19.9	+28 07.9
2	209 00.1	55.9	20	Procyon	245 44.4	+ 5 20.2
3	223 59.8	55.7				
4	238 59.5	55.5	46	R'alhague	96 46.7	+12 35.4
5	253 59.2	55.3	26	Regulus	208 29.1	+12 10.8
6	268 58.9	−22 55.0	11	Rigel	281 53.1	− 8 15.1
7	283 58.7	54.8	38	Rigil Kent.	140 51.0	−60 39.1
8	298 58.4	54.6	44	Sabik	103 02.2	−15 40.3
9	313 58.1	54.4				
10	328 57.8	54.1	3	Schedar	350 29.7	+56 18.2
11	343 57.5	53.9	45	Shaula	97 20.8	−37 04.3
12	358 57.2	−22 53.7	18	Sirius	259 11.3	−16 39.4
13	13 56.9	53.4	33	Spica	159 16.7	−10 56.0
14	28 56.6	53.2	23	Suhail	223 23.8	−43 15.2
15	43 56.3	53.0				
16	58 56.0	52.7	49	Vega	81 08.5	+38 44.5
17	73 55.8	52.5	39	Zub'g'bi	137 53.3	−15 51.6
18	88 55.5	−22 52.3				
19	103 55.2	52.0				
20	118 54.9	51.8				
21	133 54.6	51.6				
22	148 54.3	51.3				
23	163 54.0	51.1				
24	178 53.7	−22 50.8				
code	—	+ 2				

Lat. N	Sunrise h m	Twlt. begins h m	Moonrise 1 h m	2 h m	3 h m	4 h m
°						
72	▬	6 56	20 09	22 14	24 14	0 14
70	▬	6 46	20 19	22 15	24 06	0 06
68	▬	6 39	20 26	22 15	23 59	25 42
66	10 28	6 34	20 32	22 15	23 54	25 31
64	9 49	6 28	20 37	22 15	23 50	25 21
62	9 23	6 23	20 42	22 16	23 46	25 13
60	9 02	6 18	20 46	22 16	23 42	25 06
58	8 46	6 14	20 49	22 16	23 39	25 00
56	8 31	6 11	20 52	22 16	23 37	24 55
54	8 19	6 06	20 55	22 16	23 34	24 50
52	8 08	6 03	20 57	22 16	23 32	24 46
50	7 59	6 00	20 59	22 16	23 30	24 42
45	7 38	5 52	21 04	22 17	23 26	24 33
40	7 22	5 45	21 08	22 17	23 23	24 26
35	7 08	5 37	21 11	22 17	23 20	24 21
30	6 56	5 31	21 14	22 17	23 17	24 15
20	6 35	5 17	21 20	22 17	23 13	24 06
10	6 17	5 02	21 24	22 18	23 09	23 58
0	6 00	4 45	21 29	22 18	23 05	23 51
10	5 43	4 25	21 33	22 18	23 01	23 44
20	5 24	3 59	21 38	22 18	22 58	23 36
30	5 02	3 26	21 43	22 19	22 53	23 27
35	4 50	3 03	21 46	22 19	22 51	23 23
40	4 35	2 32	21 49	22 19	22 48	23 17
45	4 17	1 46	21 53	22 20	22 45	23 10
50	3 55	////	21 58	22 20	22 41	23 03
52	3 45	////	22 00	22 20	22 39	22 59
54	3 33	////	22 02	22 20	22 37	22 55
56	3 19	////	22 05	22 20	22 35	22 51
58	3 03	////	22 08	22 21	22 33	22 46
60	2 43	////	22 11	22 21	22 31	22 41
S						

Lat. N	Sunset h m	Twlt. ends h m	Moonset 1 h m	2 h m	3 h m	4 h m
°						
72	▬	17 12	10 50	10 29	10 11	9 52
70	▬	17 21	10 38	10 25	10 14	10 02
68	▬	17 28	10 28	10 22	10 16	10 10
66	13 40	17 35	10 20	10 20	10 19	10 18
64	14 18	17 40	10 14	10 17	10 21	10 24
62	14 45	17 45	10 08	10 15	10 22	10 29
60	15 05	17 49	10 02	10 14	10 24	10 33
58	15 22	17 53	9 58	10 12	10 25	10 37
56	15 36	17 57	9 54	10 11	10 26	10 41
54	15 49	18 01	9 50	10 09	10 27	10 44
52	15 59	18 04	9 47	10 08	10 28	10 47
50	16 09	18 08	9 44	10 07	10 29	10 50
45	16 29	18 15	9 37	10 05	10 31	10 56
40	16 46	18 23	9 31	10 03	10 32	11 01
35	16 59	18 29	9 26	10 01	10 34	11 05
30	17 12	18 37	9 22	10 00	10 35	11 09
20	17 32	18 50	9 15	9 57	10 37	11 16
10	17 50	19 05	9 08	9 55	10 39	11 22
0	18 07	19 22	9 02	9 52	10 40	11 27
10	18 25	19 42	8 55	9 50	10 42	11 33
20	18 43	20 07	8 48	9 48	10 44	11 38
30	19 05	20 41	8 40	9 45	10 46	11 45
35	19 17	21 03	8 36	9 43	10 47	11 49
40	19 32	21 34	8 31	9 41	10 48	11 53
45	19 50	22 20	8 24	9 39	10 50	11 59
50	20 12	////	8 17	9 36	10 52	12 05
52	20 22	////	8 14	9 35	10 53	12 08
54	20 34	////	8 10	9 34	10 54	12 11
56	20 48	////	8 06	9 32	10 55	12 14
58	21 04	////	8 01	9 30	10 56	12 18
60	21 23	////	7 56	9 29	10 57	12 22
S						

GMT	Equation of Time (App.—Mean) 1 m s	2 m s	3 m s
h			
0	− 2 59.9	− 3 28.4	− 3 56.6
6	− 3 07.1	− 3 35.5	− 4 03.6
12	− 3 14.2	− 3 42.6	− 4 10.6
18	− 3 21.3	− 3 49.6	− 4 17.6
24	− 3 28.4	− 3 56.6	− 4 24.5

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
1	2 49	14 12	8 38	3 35	9 09
2	3 41	14 13	8 36	3 31	9 05
3	4 29	14 14	8 35	3 27	9 02
4	5 16	14 15	8 34	3 23	8 58

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.6	0.1	0.1
30	0.6	0.1	0.1
45	0.6	0.1	0.0
60	0.6	0.0	0.0
75	0.6	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	1	2	3
°	′	′	′
0	18.9	17.7	16.4
4	18.8	17.7	16.4
8	18.8	17.7	16.4
12	18.8	17.7	16.4
16	18.7	17.6	16.4
20	18.7	17.6	16.4
24	18.6	17.5	16.4
28	18.5	17.5	16.3
32	18.4	17.4	16.3
36	18.3	17.4	16.3
40	18.2	17.3	16.3
44	18.1	17.2	16.2
48	17.9	17.1	16.2
52	17.8	17.0	16.2
56	17.6	16.9	16.1
60	17.5	16.8	16.1
64	17.3	16.7	16.0
68	17.1	16.6	16.0
72	17.0	16.5	15.9
76	16.8	16.4	15.9
80	16.6	16.3	15.8
84	16.4	16.1	15.8
88	16.3	16.0	15.8
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	1	2	3
°	′	′	′
0	13.7	14.3	15.0
4	13.7	14.3	15.0
8	13.7	14.3	15.1
12	13.7	14.4	15.1
16	13.8	14.4	15.1
20	13.8	14.4	15.1
24	13.9	14.5	15.1
28	14.0	14.5	15.1
32	14.1	14.6	15.2
36	14.2	14.7	15.2
40	14.3	14.8	15.2
44	14.5	14.8	15.3
48	14.6	14.9	15.3
52	14.7	15.0	15.3
56	14.9	15.1	15.4
60	15.0	15.2	15.4
64	15.2	15.3	15.5
68	15.4	15.4	15.5
72	15.5	15.5	15.5
76	15.7	15.7	15.6
80	15.9	15.8	15.6
84	16.1	15.9	15.7
88	16.2	16.0	15.7
90			

Subtract from table, back cover

New Year's Day 1

GMT	♈ GHA	VENUS −3.4 GHA	VENUS −3.4 Dec.	MARS 1.7 GHA	MARS 1.7 Dec.	JUPITER −2.0 GHA	JUPITER −2.0 Dec.	SATURN 0.8 GHA	SATURN 0.8 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
4 0	102 35.4	146 20.1	−18 32.2	231 26.4	−18 04.2	309 07.5	+12 03.9	225 10.3	−18 03.2	283 28.4	128	− 5 10.3	−124
1	117 37.9	161 19.4	31.3	246 27.2	04.6	324 10.1	03.9	240 12.5	03.2	298 00.2	129	5 22.7	−124
2	132 40.3	176 18.7	30.4	261 28.0	05.1	339 12.7	04.0	255 14.7	03.3	312 32.1	129	5 35.1	−124
3	147 42.8	191 18.1	·· 29.5	276 28.8	·· 05.5	354 15.3	·· 04.1	270 16.9	·· 03.3	327 04.0	129	· 5 47.5	−124
4	162 45.3	206 17.4	28.6	291 29.7	05.9	9 17.9	04.1	285 19.1	03.4	341 35.9	129	5 59.9	−122
5	177 47.7	221 16.8	27.7	306 30.5	06.3	24 20.5	04.2	300 21.3	03.4	356 07.8	130	6 12.1	−123
6	192 50.2	236 16.2	−18 26.8	321 31.3	−18 06.8	39 23.1	+12 04.2	315 23.5	−18 03.5	10 39.8	129	− 6 24.4	−122
7	207 52.7	251 15.5	25.9	336 32.1	07.2	54 25.7	04.3	330 25.8	03.5	25 11.7	130	6 36.6	−121
8	222 55.1	266 14.9	25.0	351 32.9	07.6	69 28.3	04.3	345 28.0	03.6	39 43.7	130	6 48.7	−121
9	237 57.6	281 14.2	·· 24.1	6 33.7	·· 08.1	84 30.9	·· 04.4	0 30.2	·· 03.6	54 15.7	130	· 7 00.8	−121
10	253 00.1	296 13.6	23.2	21 34.5	08.5	99 33.4	04.5	15 32.4	03.7	68 47.7	130	7 12.9	−120
11	268 02.5	311 12.9	22.3	36 35.3	08.9	114 36.0	04.5	30 34.6	03.7	83 19.7	130	7 24.9	−119
12	283 05.0	326 12.3	−18 21.4	51 36.1	−18 09.3	129 38.6	+12 04.6	45 36.8	−18 03.8	97 51.7	131	− 7 36.8	−119
13	298 07.4	341 11.6	20.5	66 36.9	09.8	144 41.2	04.6	60 39.1	03.8	112 23.8	130	7 48.7	−119
14	313 09.9	356 11.0	19.6	81 37.7	10.2	159 43.8	04.7	75 41.3	03.9	126 55.8	131	8 00.6	−118
15	328 12.4	11 10.4	·· 18.7	96 38.5	·· 10.6	174 46.4	·· 04.8	90 43.5	·· 03.9	141 27.9	131	· 8 12.4	−117
16	343 14.8	26 09.7	17.8	111 39.3	11.0	189 49.0	04.8	105 45.7	04.0	156 00.0	130	8 24.1	−117
17	358 17.3	41 09.1	16.9	126 40.1	11.5	204 51.6	04.9	120 47.9	04.0	170 32.0	131	8 35.8	−116
18	13 19.8	56 08.4	−18 16.0	141 40.9	−18 11.9	219 54.2	+12 04.9	135 50.1	−18 04.1	185 04.1	131	− 8 47.4	−116
19	28 22.2	71 07.8	15.0	156 41.7	12.3	234 56.8	05.0	150 52.3	04.1	199 36.2	131	8 59.0	−115
20	43 24.7	86 07.2	14.1	171 42.5	12.7	249 59.4	05.1	165 54.6	04.1	214 08.3	131	9 10.5	−115
21	58 27.2	101 06.5	·· 13.2	186 43.3	·· 13.2	265 02.0	·· 05.1	180 56.8	·· 04.2	228 40.4	131	· 9 22.0	−114
22	73 29.6	116 05.9	12.3	201 44.1	13.6	280 04.6	05.2	195 59.0	04.2	243 12.5	131	9 33.4	−114
23	88 32.1	131 05.2	11.4	216 44.9	14.0	295 07.2	05.2	211 01.2	04.3	257 44.6	131	9 44.8	−113
5 0	103 34.6	146 04.6	−18 10.5	231 45.7	−18 14.4	310 09.8	+12 05.3	226 03.4	−18 04.3	272 16.7	131	− 9 56.1	−112
1	118 37.0	161 04.0	09.6	246 46.5	14.9	325 12.4	05.4	241 05.6	04.4	286 48.8	131	10 07.3	−112
2	133 39.5	176 03.3	08.6	261 47.3	15.3	340 15.0	05.4	256 07.9	04.4	301 20.9	132	10 18.5	−111
3	148 41.9	191 02.7	·· 07.7	276 48.1	·· 15.7	355 17.6	·· 05.5	271 10.1	·· 04.5	315 53.1	131	·10 29.6	−110
4	163 44.4	206 02.1	06.8	291 48.9	16.1	10 20.2	05.5	286 12.3	04.5	330 25.2	131	10 40.6	−110
5	178 46.9	221 01.4	05.9	306 49.7	16.6	25 22.8	05.6	301 14.5	04.6	344 57.3	131	10 51.6	−110
6	193 49.3	236 00.8	−18 05.0	321 50.5	−18 17.0	40 25.3	+12 05.7	316 16.7	−18 04.6	359 29.4	131	−11 02.6	−108
7	208 51.8	251 00.2	04.0	336 51.3	17.4	55 27.9	05.7	331 18.9	04.7	14 01.5	131	11 13.4	−108
8	223 54.3	265 59.5	03.1	351 52.1	17.8	70 30.5	05.8	346 21.2	04.7	28 33.6	131	11 24.2	−108
9	238 56.7	280 58.9	·· 02.2	6 52.9	·· 18.3	85 33.1	·· 05.8	1 23.4	·· 04.8	43 05.7	131	·11 35.0	−106
10	253 59.2	295 58.3	01.3	21 53.7	18.7	100 35.7	05.9	16 25.6	04.8	57 37.8	131	11 45.6	−107
11	269 01.7	310 57.6	18 00.4	36 54.5	19.1	115 38.3	06.0	31 27.8	04.9	72 09.9	131	11 56.3	−105
12	284 04.1	325 57.0	−17 59.4	51 55.3	−18 19.5	130 40.9	+12 06.0	46 30.0	−18 04.9	86 42.0	130	−12 06.8	−105
13	299 06.6	340 56.4	58.5	66 56.1	19.9	145 43.5	06.1	61 32.2	05.0	101 14.0	131	12 17.3	−104
14	314 09.1	355 55.7	57.6	81 56.9	20.4	160 46.1	06.2	76 34.5	05.0	115 46.1	131	12 27.7	−103
15	329 11.5	10 55.1	·· 56.6	96 57.7	·· 20.8	175 48.7	·· 06.2	91 36.7	·· 05.1	130 18.2	130	·12 38.0	−103
16	344 14.0	25 54.5	55.7	111 58.5	21.2	190 51.3	06.3	106 38.9	05.1	144 50.2	131	12 48.3	−102
17	359 16.4	40 53.9	54.8	126 59.3	21.6	205 54.0	06.3	121 41.1	05.1	159 22.3	130	12 58.5	−101
18	14 18.9	55 53.2	−17 53.9	142 00.1	−18 22.0	220 56.6	+12 06.4	136 43.3	−18 05.2	173 54.3	130	−13 08.6	−101
19	29 21.4	70 52.6	52.9	157 00.9	22.5	235 59.2	06.5	151 45.5	05.2	188 26.3	130	13 18.7	−100
20	44 23.8	85 52.0	52.0	172 01.7	22.9	251 01.8	06.5	166 47.8	05.3	202 58.3	130	13 28.7	− 99
21	59 26.3	100 51.4	·· 51.1	187 02.5	·· 23.3	266 04.4	·· 06.6	181 50.0	·· 05.3	217 30.3	130	·13 38.6	− 99
22	74 28.8	115 50.7	50.1	202 03.3	23.7	281 07.0	06.7	196 52.2	05.4	232 02.3	130	13 48.5	− 97
23	89 31.2	130 50.1	49.2	217 04.1	24.1	296 09.6	06.7	211 54.4	05.4	246 34.3	130	13 58.2	− 98
6 0	104 33.7	145 49.5	−17 48.3	232 04.9	−18 24.6	311 12.2	+12 06.8	226 56.6	−18 05.5	261 06.3	129	−14 08.0	− 96
1	119 36.2	160 48.9	47.3	247 05.7	25.0	326 14.8	06.8	241 58.9	05.5	275 38.2	130	14 17.6	− 95
2	134 38.6	175 48.3	46.4	262 06.5	25.4	341 17.4	06.9	257 01.1	05.6	290 10.2	129	14 27.1	− 95
3	149 41.1	190 47.6	·· 45.4	277 07.3	·· 25.8	356 20.0	·· 07.0	272 03.3	·· 05.6	304 42.1	129	·14 36.6	− 94
4	164 43.6	205 47.0	44.5	292 08.1	26.2	11 22.6	07.0	287 05.5	05.7	319 14.0	129	14 46.0	− 94
5	179 46.0	220 46.4	43.6	307 08.9	26.6	26 25.2	07.1	302 07.7	05.7	333 45.9	129	14 55.4	− 92
6	194 48.5	235 45.8	−17 42.6	322 09.7	−18 27.1	41 27.8	+12 07.2	317 09.9	−18 05.8	348 17.8	129	−15 04.6	− 92
7	209 50.9	250 45.2	41.7	337 10.5	27.5	56 30.4	07.2	332 12.2	05.8	2 49.7	128	15 13.8	− 91
8	224 53.4	265 44.5	40.7	352 11.3	27.9	71 33.0	07.3	347 14.4	05.8	17 21.5	128	15 22.9	− 90
9	239 55.9	280 43.9	·· 39.8	7 12.1	·· 28.3	86 35.6	·· 07.3	2 16.6	·· 05.9	31 53.3	129	·15 31.9	− 90
10	254 58.3	295 43.3	38.9	22 12.9	28.7	101 38.2	07.4	17 18.8	05.9	46 25.2	127	15 40.9	− 88
11	270 00.8	310 42.7	37.9	37 13.7	29.1	116 40.8	07.5	32 21.0	06.0	60 56.9	128	15 49.7	− 88
12	285 03.3	325 42.1	−17 37.0	52 14.5	−18 29.6	131 43.4	+12 07.5	47 23.3	−18 06.0	75 28.7	128	−15 58.5	− 87
13	300 05.7	340 41.5	36.0	67 15.3	30.0	146 46.0	07.6	62 25.5	06.1	90 00.5	127	16 07.2	− 87
14	315 08.2	355 40.9	35.1	82 16.1	30.4	161 48.6	07.7	77 27.7	06.1	104 32.2	128	16 15.9	− 85
15	330 10.7	10 40.2	·· 34.1	97 16.9	·· 30.8	176 51.3	·· 07.7	92 29.9	·· 06.2	119 04.0	127	·16 24.4	− 85
16	345 13.1	25 39.6	33.2	112 17.7	31.2	191 53.9	07.8	107 32.1	06.2	133 35.7	126	16 32.9	− 83
17	0 15.6	40 39.0	32.2	127 18.5	31.6	206 56.5	07.9	122 34.4	06.3	148 07.3	127	16 41.2	− 83
18	15 18.0	55 38.4	−17 31.3	142 19.3	−18 32.0	221 59.1	+12 07.9	137 36.6	−18 06.3	162 39.0	127	−16 49.5	− 83
19	30 20.5	70 37.8	30.3	157 20.1	32.5	237 01.7	08.0	152 38.8	06.4	177 10.7	126	16 57.8	− 81
20	45 23.0	85 37.2	29.4	172 20.9	32.9	252 04.3	08.1	167 41.0	06.4	191 42.3	126	17 05.9	− 80
21	60 25.4	100 36.6	·· 28.4	187 21.7	·· 33.3	267 06.9	·· 08.1	182 43.2	·· 06.5	206 13.9	126	·17 13.9	− 80
22	75 27.9	115 36.0	27.5	202 22.4	33.7	282 09.5	08.2	197 45.5	06.5	220 45.5	125	17 21.9	− 79
23	90 30.4	130 35.4	26.5	217 23.2	34.1	297 12.1	08.3	212 47.7	06.5	235 17.0	126	17 29.8	− 78
24	105 32.8	145 34.8	−17 25.5	232 24.0	−18 34.5	312 14.7	+12 08.3	227 49.9	−18 06.6	249 48.6	125	−17 37.6	− 77
code	—	− 6	+ 9	+ 8	− 4	+ 26	+ 1	+ 22	− 1				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
4 00	178 53.7	−22 50.8	7	Acamar	315 50.7	−40 29.0
01	193 53.4	50.6	5	Achernar	335 58.6	−57 27.8
02	208 53.2	50.4	30	Acrux	173 57.4	−62 51.2
03	223 52.9	50.1	19	Adhara	255 46.0	−28 54.8
04	238 52.6	49.9	10	Aldebaran	291 38.5	+16 25.4
05	253 52.3	49.6				
06	268 52.0	−22 49.4	32	Alioth	166 58.3	+56 11.5
07	283 51.7	49.1	34	Alkaid	153 32.8	+49 31.6
08	298 51.4	48.9	55	Al Na'ir	28 38.0	−47 10.6
09	313 51.1	48.7	15	Alnilam	276 29.7	− 1 13.8
10	328 50.9	48.4	25	Alphard	218 38.1	− 8 28.1
11	343 50.6	48.2				
12	358 50.3	−22 47.9	41	Alphecca	126 47.7	+26 51.5
13	13 50.0	47.7	1	Alpheratz	358 28.2	+28 51.1
14	28 49.7	47.4	51	Altair	62 50.5	+ 8 45.1
15	43 49.4	47.2	2	Ankaa	353 58.1	−42 32.8
16	58 49.1	46.9	42	Antares	113 19.4	−26 20.1
17	73 48.8	46.7				
18	88 48.6	−22 46.4	37	Arcturus	146 35.1	+19 24.4
19	103 48.3	46.1	43	Atria	109 00.4	−68 56.8
20	118 48.0	45.9	22	Avior	234 35.0	−59 22.1
21	133 47.7	45.6	13	Bellatrix	279 17.9	+ 6 18.6
22	148 47.4	45.4	16	Betelg'se	271 47.6	+ 7 24.0
23	163 47.1	45.1				
			17	Canopus	264 14.7	−52 40.4
5 00	178 46.8	−22 44.9	12	Capella	281 37.6	+45 57.4
01	193 46.6	44.6	53	Deneb	50 01.3	+45 07.5
02	208 46.3	44.3	28	Denebola	183 17.4	+14 48.8
03	223 46.0	44.1	4	Diphda	349 39.0	−18 13.7
04	238 45.7	43.8				
05	253 45.4	43.6	27	Dubhe	194 44.0	+61 58.9
06	268 45.1	−22 43.3	14	Elnath	279 06.7	+28 34.3
07	283 44.9	43.0	47	Eltanin	91 06.7	+51 29.6
08	298 44.6	42.8	54	Enif	34 29.6	+ 9 40.5
09	313 44.3	42.5	56	Fomalhaut	16 11.6	−29 51.4
10	328 44.0	42.2				
11	343 43.7	42.0	31	Gacrux	172 48.9	−56 51.9
12	358 43.4	−22 41.7	29	Gienah	176 36.6	−17 17.9
13	13 43.2	41.4	35	Hadar	149 49.3	−60 09.5
14	28 42.9	41.2	6	Hamal	328 49.3	+23 15.5
15	43 42.6	40.9	48	Kaus Aust.	84 41.3	−34 24.4
16	58 42.3	40.6				
17	73 42.0	40.3	40	Kochab	137 18.6	+74 19.8
18	88 41.7	−22 40.1	57	Markab	14 21.4	+14 58.3
19	103 41.5	39.8	8	Menkar	314 59.9	+ 3 55.1
20	118 41.2	39.5	36	Menkent	148 58.5	−36 09.2
21	133 40.9	39.2	24	Miapl'dus	221 48.1	−69 32.1
22	148 40.6	39.0				
23	163 40.3	38.7	9	Mirfak	309 41.7	+49 42.6
			50	Nunki	76 52.0	−26 21.2
6 00	178 40.1	−22 38.4	52	Peacock	54 27.5	−56 52.7
01	193 39.8	38.1	21	Pollux	244 19.9	+28 07.9
02	208 39.5	37.9	20	Procyon	245 44.4	+ 5 20.2
03	223 39.2	37.6				
04	238 38.9	37.3	46	R'alhague	96 46.7	+12 35.4
05	253 38.7	37.0	26	Regulus	208 29.0	+12 10.8
06	268 38.4	−22 36.7	11	Rigel	281 53.1	− 8 15.1
07	283 38.1	36.5	38	Rigil Kent.	140 50.9	−60 39.2
08	298 37.8	36.2	44	Sabik	103 02.2	−15 40.3
09	313 37.5	35.9				
10	328 37.3	35.6	3	Schedar	350 29.7	+56 18.2
11	343 37.0	35.3	45	Shaula	97 20.8	−37 04.3
12	358 36.7	−22 35.0	18	Sirius	259 11.3	−16 39.4
13	13 36.4	34.7	33	Spica	159 16.7	−10 56.0
14	28 36.2	34.5	23	Suhail	223 23.8	−43 15.3
15	43 35.9	34.2				
16	58 35.6	33.9	49	Vega	81 08.5	+38 44.5
17	73 35.3	33.6	39	Zub'g'bi	137 53.3	−15 51.6
18	88 35.0	−22 33.3				
19	103 34.8	33.0				
20	118 34.5	32.7				
21	133 34.2	32.4				
22	148 33.9	32.1				
23	163 33.7	31.8				
24	178 33.4	−22 31.5				
code	—	+ 3				

Lat. N°	Sunrise h m	Twlt. begins h m	Moonrise 4 h m	5 h m	6 h m	7 h m
72	▬	6 52	0 14	2 14	4 25	▬
70	▬	6 44	0 06	1 56	3 50	5 58
68	11 37	6 38	25 42	1 42	3 25	5 12
66	10 22	6 32	25 31	1 31	3 06	4 42
64	9 46	6 27	25 21	1 21	2 51	4 19
62	9 20	6 22	25 13	1 13	2 39	4 02
60	9 01	6 18	25 06	1 06	2 28	3 47
58	8 44	6 14	25 00	1 00	2 19	3 34
56	8 30	6 10	24 55	0 55	2 11	3 24
54	8 18	6 07	24 50	0 50	2 03	3 14
52	8 08	6 03	24 46	0 46	1 57	3 06
50	7 58	6 00	24 42	0 42	1 51	2 58
45	7 38	5 52	24 33	0 33	1 39	2 42
40	7 22	5 45	24 26	0 26	1 29	2 29
35	7 09	5 38	24 21	0 21	1 20	2 18
30	6 57	5 31	24 15	0 15	1 12	2 08
20	6 36	5 18	24 06	0 06	0 59	1 52
10	6 18	5 03	23 58	24 48	0 48	1 37
0	6 01	4 46	23 51	24 37	0 37	1 24
10	5 44	4 27	23 44	24 27	0 27	1 11
20	5 26	4 01	23 36	24 15	0 15	0 56
30	5 05	3 28	23 27	24 03	0 03	0 40
35	4 52	3 05	23 23	23 55	24 31	0 31
40	4 38	2 36	23 17	23 47	24 20	0 20
45	4 20	1 51	23 10	23 37	24 08	0 08
50	3 59	////	23 03	23 26	23 52	24 23
52	3 48	////	22 59	23 21	23 45	24 15
54	3 37	////	22 55	23 15	23 38	24 05
56	3 23	////	22 51	23 08	23 29	23 55
58	3 07	////	22 46	23 01	23 19	23 42
60	2 48	////	22 41	22 53	23 08	23 28

Lat. N°	Sunset h m	Twlt. ends h m	Moonset 4 h m	5 h m	6 h m	7 h m
72	▬	17 18	9 52	9 29	8 55	▬
70	▬	17 26	10 02	9 48	9 31	9 00
68	12 33	17 34	10 10	10 04	9 57	9 48
66	13 49	17 39	10 18	10 17	10 17	10 18
64	14 25	17 44	10 24	10 27	10 33	10 41
62	14 50	17 49	10 29	10 36	10 46	11 00
60	15 10	17 53	10 33	10 44	10 58	11 15
58	15 26	17 56	10 37	10 51	11 07	11 28
56	15 40	18 00	10 41	10 57	11 16	11 39
54	15 52	18 04	10 44	11 03	11 24	11 49
52	16 03	18 08	10 47	11 08	11 31	11 58
50	16 12	18 10	10 50	11 12	11 37	12 06
45	16 32	18 18	10 56	11 22	11 51	12 23
40	16 48	18 25	11 01	11 31	12 02	12 37
35	17 02	18 32	11 05	11 38	12 12	12 48
30	17 14	18 39	11 09	11 44	12 20	12 59
20	17 34	18 52	11 16	11 55	12 35	13 17
10	17 52	19 07	11 22	12 04	12 47	13 32
0	18 09	19 24	11 27	12 13	13 00	13 47
10	18 26	19 43	11 33	12 22	13 12	14 01
20	18 44	20 07	11 38	12 32	13 24	14 17
30	19 05	20 40	11 45	12 43	13 39	14 35
35	19 18	21 03	11 49	12 49	13 48	14 45
40	19 32	21 33	11 53	12 56	13 58	14 58
45	19 49	22 16	11 59	13 05	14 09	15 12
50	20 11	////	12 05	13 15	14 23	15 29
52	20 21	////	12 08	13 20	14 30	15 37
54	20 33	////	12 11	13 25	14 37	15 47
56	20 46	////	12 14	13 31	14 46	15 57
58	21 02	////	12 18	13 38	14 55	16 09
60	21 21	////	12 22	13 45	15 06	16 23

GMT h	Equation of Time (App.−Mean) 4 m s	5 m s	6 m s
0	− 4 24.5	− 4 52.0	− 5 19.2
6	− 4 31.4	− 4 58.9	− 5 25.9
12	− 4 38.3	− 5 05.7	− 5 32.6
18	− 4 45.2	− 5 12.4	− 5 39.3
24	− 4 52.0	− 5 19.2	− 5 45.9

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
4	5 16	14 15	8 34	3 23	8 58
5	6 02	14 16	8 33	3 19	8 54
6	6 48	14 17	8 31	3 15	8 51
7	7 35	14 18	8 30	3 11	8 47

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.6	0.1	0.1
30	0.6	0.1	0.1
45	0.6	0.1	0.0
60	0.6	0.0	0.0
75	0.6	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	4	5	6
°	′	′	′
0	15.3	14.3	13.4
4	15.3	14.3	13.4
8	15.3	14.3	13.4
12	15.3	14.3	13.4
16	15.3	14.3	13.5
20	15.3	14.4	13.5
24	15.3	14.4	13.6
28	15.3	14.4	13.6
32	15.3	14.4	13.7
36	15.3	14.5	13.7
40	15.3	14.5	13.8
44	15.4	14.6	13.9
48	15.4	14.6	14.0
52	15.4	14.7	14.1
56	15.4	14.7	14.2
60	15.4	14.8	14.3
64	15.4	14.9	14.4
68	15.4	14.9	14.5
72	15.4	15.0	14.6
76	15.5	15.1	14.7
80	15.5	15.1	14.9
84	15.5	15.2	15.0
88	15.5	15.3	15.1
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	4	5	6
°	′	′	′
0	15.7	16.3	16.8
4	15.7	16.3	16.8
8	15.7	16.3	16.8
12	15.7	16.2	16.7
16	15.7	16.2	16.7
20	15.7	16.2	16.7
24	15.7	16.2	16.6
28	15.7	16.1	16.6
32	15.7	16.1	16.5
36	15.7	16.1	16.4
40	15.6	16.0	16.4
44	15.6	16.0	16.3
48	15.6	15.9	16.2
52	15.6	15.9	16.1
56	15.6	15.8	16.0
60	15.6	15.7	15.9
64	15.6	15.7	15.8
68	15.6	15.6	15.7
72	15.6	15.6	15.6
76	15.5	15.5	15.4
80	15.5	15.4	15.3
84	15.5	15.3	15.2
88	15.5	15.3	15.1
90			

Subtract from table, back cover

Quarter 4
phany 6

1956 JANUARY 7, 8, 9, (SAT., SUN., MON.)

GMT	♈ GHA	VENUS −3.4 GHA	VENUS −3.4 Dec.	MARS 1.7 GHA	MARS 1.7 Dec.	JUPITER −2.0 GHA	JUPITER −2.0 Dec.	SATURN 0.8 GHA	SATURN 0.8 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
7 00	105 32.8	145 34.8	−17 25.5	232 24.0	−18 34.5	312 14.7	+12 08.3	227 49.9	−18 06.6	249 48.6	125	−17 37.6	77
01	120 35.3	160 34.1	24.6	247 24.8	34.9	327 17.4	08.4	242 52.1	06.6	264 20.1	125	17 45.3	76
02	135 37.8	175 33.5	23.6	262 25.6	35.4	342 20.0	08.5	257 54.3	06.7	278 51.6	125	17 52.9	75
03	150 40.2	190 32.9	22.7	277 26.4	35.8	357 22.6	08.5	272 56.6	06.7	293 23.1	124	−18 00.4	75
04	165 42.7	205 32.3	21.7	292 27.2	36.2	12 25.2	08.6	287 58.8	06.8	307 54.5	125	18 07.9	73
05	180 45.2	220 31.7	20.8	307 28.0	36.6	27 27.8	08.6	303 01.0	06.8	322 26.0	124	18 15.2	73
06	195 47.6	235 31.1	−17 19.8	322 28.8	−18 37.0	42 30.4	+12 08.7	318 03.2	−18 06.9	336 57.4	124	−18 22.5	72
07	210 50.1	250 30.5	18.8	337 29.6	37.4	57 33.0	08.8	333 05.5	06.9	351 28.8	123	18 29.7	71
08	225 52.5	265 29.9	17.9	352 30.4	37.8	72 35.6	08.8	348 07.7	07.0	6 00.1	124	18 36.8	70
09	240 55.0	280 29.3	16.9	7 31.2	38.2	87 38.3	08.9	3 09.9	07.0	20 31.5	123	−18 43.8	69
10	255 57.5	295 28.7	15.9	22 32.0	38.6	102 40.9	09.0	18 12.1	07.1	35 02.8	123	18 50.7	68
11	270 59.9	310 28.1	15.0	37 32.8	39.1	117 43.5	09.0	33 14.3	07.1	49 34.1	123	18 57.5	68
12	286 02.4	325 27.5	−17 14.0	52 33.6	−18 39.5	132 46.1	+12 09.1	48 16.6	−18 07.1	64 05.4	123	−19 04.3	66
13	301 04.9	340 26.9	13.0	67 34.4	39.9	147 48.7	09.2	63 18.8	07.2	78 36.7	122	19 10.9	65
14	316 07.3	355 26.3	12.1	82 35.1	40.3	162 51.3	09.2	78 21.0	07.2	93 07.9	122	19 17.4	65
15	331 09.8	10 25.7	11.1	97 35.9	40.7	177 53.9	09.3	93 23.2	07.3	107 39.1	122	−19 23.9	64
16	346 12.3	25 25.1	10.1	112 36.7	41.1	192 56.6	09.4	108 25.4	07.3	122 10.3	122	19 30.3	62
17	1 14.7	40 24.5	09.2	127 37.5	41.5	207 59.2	09.4	123 27.7	07.4	136 41.5	121	19 36.5	62
18	16 17.2	55 23.9	−17 08.2	142 38.3	−18 41.9	223 01.8	+12 09.5	138 29.9	−18 07.4	151 12.6	121	−19 42.7	61
19	31 19.7	70 23.3	07.2	157 39.1	42.3	238 04.4	09.6	153 32.1	07.5	165 43.7	121	19 48.8	60
20	46 22.1	85 22.7	06.3	172 39.9	42.7	253 07.0	09.7	168 34.3	07.5	180 14.8	121	19 54.8	59
21	61 24.6	100 22.1	05.3	187 40.7	43.1	268 09.6	09.7	183 36.6	07.6	194 45.9	121	−20 00.7	58
22	76 27.0	115 21.5	04.3	202 41.5	43.5	283 12.3	09.8	198 38.8	07.6	209 17.0	120	20 06.5	57
23	91 29.5	130 21.0	03.3	217 42.3	44.0	298 14.9	09.9	213 41.0	07.6	223 48.0	120	20 12.2	56
8 00	106 32.0	145 20.4	−17 02.4	232 43.1	−18 44.4	313 17.5	+12 09.9	228 43.2	−18 07.7	238 19.0	120	−20 17.8	55
01	121 34.4	160 19.8	01.4	247 43.9	44.8	328 20.1	10.0	243 45.5	07.7	252 50.0	120	20 23.3	54
02	136 36.9	175 19.2	17 00.4	262 44.6	45.2	343 22.7	10.1	258 47.7	07.8	267 21.0	119	20 28.7	53
03	151 39.4	190 18.6	−16 59.4	277 45.4	45.6	358 25.4	10.1	273 49.9	07.8	281 51.9	120	−20 34.0	52
04	166 41.8	205 18.0	58.5	292 46.2	46.0	13 28.0	10.2	288 52.1	07.9	296 22.9	119	20 39.2	51
05	181 44.3	220 17.4	57.5	307 47.0	46.4	28 30.6	10.3	303 54.3	07.9	310 53.8	119	20 44.3	51
06	196 46.8	235 16.8	−16 56.5	322 47.8	−18 46.8	43 33.2	+12 10.3	318 56.6	−18 08.0	325 24.7	118	−20 49.4	49
07	211 49.2	250 16.2	55.5	337 48.6	47.2	58 35.8	10.4	333 58.8	08.0	339 55.5	119	20 54.3	48
08	226 51.7	265 15.6	54.5	352 49.4	47.6	73 38.5	10.5	349 01.0	08.1	354 26.4	118	20 59.1	47
09	241 54.1	280 15.1	53.6	7 50.2	48.0	88 41.1	10.5	4 03.2	08.1	8 57.2	118	−21 03.8	47
10	256 56.6	295 14.5	52.6	22 51.0	48.4	103 43.7	10.6	19 05.5	08.1	23 28.0	118	21 08.5	45
11	271 59.1	310 13.9	51.6	37 51.8	48.8	118 46.3	10.7	34 07.7	08.2	37 58.8	118	21 13.0	44
12	287 01.5	325 13.3	−16 50.6	52 52.6	−18 49.2	133 48.9	+12 10.7	49 09.9	−18 08.2	52 29.6	117	−21 17.4	43
13	302 04.0	340 12.7	49.6	67 53.3	49.6	148 51.6	10.8	64 12.1	08.3	67 00.3	118	21 21.7	43
14	317 06.5	355 12.1	48.6	82 54.1	50.0	163 54.2	10.9	79 14.4	08.3	81 31.1	117	21 26.0	41
15	332 08.9	10 11.5	47.6	97 54.9	50.4	178 56.8	11.0	94 16.6	08.4	96 01.8	117	−21 30.1	40
16	347 11.4	25 11.0	46.7	112 55.7	50.8	193 59.4	11.0	109 18.8	08.4	110 32.5	116	21 34.1	39
17	2 13.9	40 10.4	45.7	127 56.5	51.2	209 02.1	11.1	124 21.0	08.5	125 03.1	117	21 38.0	38
18	17 16.3	55 09.8	−16 44.7	142 57.3	−18 51.6	224 04.7	+12 11.2	139 23.3	−18 08.5	139 33.8	117	−21 41.8	37
19	32 18.8	70 09.2	43.7	157 58.1	52.0	239 07.3	11.2	154 25.5	08.6	154 04.5	116	21 45.5	37
20	47 21.3	85 08.6	42.7	172 58.9	52.5	254 09.9	11.3	169 27.7	08.6	168 35.1	116	21 49.2	35
21	62 23.7	100 08.1	41.7	187 59.6	52.9	269 12.5	11.4	184 29.9	08.6	183 05.7	116	−21 52.7	34
22	77 26.2	115 07.5	40.7	203 00.4	53.3	284 15.2	11.4	199 32.2	08.7	197 36.3	116	21 56.1	33
23	92 28.6	130 06.9	39.7	218 01.2	53.7	299 17.8	11.5	214 34.4	08.7	212 06.9	116	21 59.4	32
9 00	107 31.1	145 06.3	−16 38.7	233 02.0	−18 54.1	314 20.4	+12 11.6	229 36.6	−18 08.8	226 37.5	115	−22 02.6	31
01	122 33.6	160 05.7	37.7	248 02.8	54.5	329 23.0	11.7	244 38.8	08.8	241 08.0	116	22 05.7	30
02	137 36.0	175 05.2	36.7	263 03.6	54.9	344 25.7	11.7	259 41.1	08.9	255 38.6	115	22 08.7	29
03	152 38.5	190 04.6	35.7	278 04.4	55.3	359 28.3	11.8	274 43.3	08.9	270 09.1	115	−22 11.6	27
04	167 41.0	205 04.0	34.7	293 05.2	55.7	14 30.9	11.9	289 45.5	09.0	284 39.6	115	22 14.3	27
05	182 43.4	220 03.4	33.7	308 05.9	56.1	29 33.6	11.9	304 47.7	09.0	299 10.1	115	22 17.0	26
06	197 45.9	235 02.9	−16 32.7	323 06.7	−18 56.5	44 36.2	+12 12.0	319 50.0	−18 09.0	313 40.6	115	−22 19.6	25
07	212 48.4	250 02.3	31.7	338 07.5	56.9	59 38.8	12.1	334 52.2	09.1	328 11.1	115	22 22.1	23
08	227 50.8	265 01.7	30.7	353 08.3	57.3	74 41.4	12.2	349 54.4	09.1	342 41.6	114	22 24.4	23
09	242 53.3	280 01.1	29.7	8 09.1	57.7	89 44.1	12.2	4 56.7	09.2	357 12.0	115	−22 26.7	21
10	257 55.8	295 00.6	28.7	23 09.9	58.1	104 46.7	12.3	19 58.9	09.2	11 42.5	114	22 28.8	21
11	272 58.2	310 00.0	27.7	38 10.7	58.5	119 49.3	12.4	35 01.1	09.3	26 12.9	114	22 30.9	19
12	288 00.7	324 59.4	−16 26.7	53 11.5	−18 58.9	134 51.9	+12 12.4	50 03.3	−18 09.3	40 43.3	115	−22 32.8	19
13	303 03.1	339 58.9	25.7	68 12.2	59.3	149 54.6	12.5	65 05.6	09.4	55 13.8	114	22 34.7	17
14	318 05.6	354 58.3	24.7	83 13.0	18 59.6	164 57.2	12.6	80 07.8	09.4	69 44.2	114	22 36.4	16
15	333 08.1	9 57.7	23.7	98 13.8	−19 00.0	179 59.8	12.7	95 10.0	09.4	84 14.6	114	−22 38.0	15
16	348 10.5	24 57.1	22.7	113 14.6	00.4	195 02.5	12.7	110 12.2	09.5	98 45.0	114	22 39.5	15
17	3 13.0	39 56.6	21.7	128 15.4	00.8	210 05.1	12.8	125 14.5	09.5	113 15.4	114	22 41.0	13
18	18 15.5	54 56.0	−16 20.7	143 16.2	−19 01.2	225 07.7	+12 12.9	140 16.7	−18 09.6	127 45.8	114	−22 42.3	12
19	33 17.9	69 55.4	19.7	158 17.0	01.6	240 10.4	12.9	155 18.9	09.6	142 16.2	114	22 43.5	10
20	48 20.4	84 54.9	18.7	173 17.7	02.0	255 13.0	13.0	170 21.2	09.7	156 46.6	114	22 44.5	10
21	63 22.9	99 54.3	17.7	188 18.5	02.4	270 15.6	13.1	185 23.4	09.7	171 17.0	114	−22 45.5	9
22	78 25.3	114 53.7	16.7	203 19.3	02.8	285 18.3	13.2	200 25.6	09.8	185 47.4	113	22 46.4	8
23	93 27.8	129 53.2	15.6	218 20.1	03.2	300 20.9	13.2	215 27.8	09.8	200 17.7	114	22 47.2	6
24	108 30.3	144 52.6	−16 14.6	233 20.9	−19 03.6	315 23.5	+12 13.3	230 30.1	−18 09.8	214 48.1	114	−22 47.8	6
code	—	− 6	+ 10	+ 7	− 4	+ 27	+ 1	+ 22	− 1				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
7 0	178 33.4	−22 31.5	7	Acamar	315 50.7	−40 29.0
1	193 33.1	31.2	5	Achernar	335 58.6	−57 27.8
2	208 32.8	30.9	30	Acrux	173 57.4	−62 51.2
3	223 32.6	·· 30.6	19	Adhara	255 46.0	−28 54.8
4	238 32.3	30.3	10	Aldebaran	291 38.5	+16 25.4
5	253 32.0	30.0				
6	268 31.7	−22 29.7	32	Alioth	166 58.3	+56 11.5
7	283 31.5	29.4	34	Alkaid	153 32.8	+49 31.6
8	298 31.2	29.1	55	Al Na'ir	28 38.0	−47 10.6
9	313 30.9	·· 28.8	15	Alnilam	276 29.7	− 1 13.8
10	328 30.6	28.5	25	Alphard	218 38.1	− 8 28.2
11	343 30.4	28.2				
12	358 30.1	−22 27.9	41	Alphecca	126 47.7	+26 51.5
13	13 29.8	27.6	1	Alpheratz	358 28.2	+28 51.1
14	28 29.5	27.3	51	Altair	62 50.5	+ 8 45.1
15	43 29.3	·· 27.0	2	Ankaa	353 58.1	−42 32.8
16	58 29.0	26.7	42	Antares	113 19.4	−26 20.1
17	73 28.7	26.4				
18	88 28.4	−22 26.1	37	Arcturus	146 35.1	+19 24.4
19	103 28.2	25.8	43	Atria	109 00.3	−68 56.8
20	118 27.9	25.4	22	Avior	234 35.0	−59 22.1
21	133 27.6	·· 25.1	13	Bellatrix	279 17.9	+ 6 18.6
22	148 27.4	24.8	16	Betelg'se	271 47.6	+ 7 24.0
23	163 27.1	24.5				
			17	Canopus	264 14.7	−52 40.4
8 0	178 26.8	−22 24.2	12	Capella	281 37.6	+45 57.4
1	193 26.5	23.9	53	Deneb	50 01.3	+45 07.5
2	208 26.3	23.6	28	Denebola	183 17.4	+14 48.8
3	223 26.0	·· 23.2	4	Diphda	349 39.1	− 18 13.7
4	238 25.7	22.9				
5	253 25.5	22.6	27	Dubhe	194 43.9	+61 58.9
6	268 25.2	−22 22.3	14	Elnath	279 06.7	+28 34.3
7	283 24.9	22.0	47	Eltanin	91 06.7	+51 29.5
8	298 24.6	21.7	54	Enif	34 29.6	+ 9 40.5
9	313 24.4	·· 21.3	56	Fomalhaut	16 11.6	−29 51.4
10	328 24.1	21.0				
11	343 23.8	20.7	31	Gacrux	172 48.9	−56 51.9
12	358 23.6	−22 20.4	29	Gienah	176 36.5	−17 17.9
13	13 23.3	20.0	35	Hadar	149 49.2	−60 09.5
14	28 23.0	19.7	6	Hamal	328 49.3	+23 15.5
15	43 22.8	·· 19.4	48	Kaus Aust.	84 41.3	−34 24.4
16	58 22.5	19.1				
17	73 22.2	18.7	40	Kochab	137 18.5	+74 19.8
18	88 22.0	−22 18.4	57	Markab	14 21.4	+14 58.3
19	103 21.7	18.1	8	Menkar	314 59.9	+ 3 55.1
20	118 21.4	17.7	36	Menkent	148 58.5	−36 09.2
21	133 21.2	·· 17.4	24	Miapl'dus	221 48.1	−69 32.1
22	148 20.9	17.1				
23	163 20.6	16.8	9	Mirfak	309 41.7	+49 42.6
			50	Nunki	76 52.0	−26 21.1
9 0	178 20.4	−22 16.4	52	Peacock	54 27.5	−56 52.7
1	193 20.1	16.1	21	Pollux	244 19.9	+28 07.9
2	208 19.8	15.8	20	Procyon	245 44.4	+ 5 20.2
3	223 19.6	·· 15.4				
4	238 19.3	15.1	46	R'alhague	96 46.7	+12 35.4
5	253 19.0	14.7	26	Regulus	208 29.0	+12 10.8
6	268 18.8	−22 14.4	11	Rigel	281 53.1	− 8 15.1
7	283 18.5	14.1	38	Rigil Kent.	140 50.9	−60 39.2
8	298 18.2	13.7	44	Sabik	103 02.2	−15 40.3
9	313 18.0	·· 13.4				
10	328 17.7	13.1	3	Schedar	350 29.8	+56 18.2
11	343 17.4	12.7	45	Shaula	97 20.7	−37 04.3
12	358 17.2	−22 12.4	18	Sirius	259 11.3	−16 39.4
13	13 16.9	12.0	33	Spica	159 16.7	−10 56.0
14	28 16.7	11.7	23	Suhail	223 23.7	−43 15.3
15	43 16.4	·· 11.3				
16	58 16.1	11.0	49	Vega	81 08.5	+38 44.5
17	73 15.9	10.6	39	Zub'g'bi	137 53.2	−15 51.6
18	88 15.6	−22 10.3				
19	103 15.3	10.0				
20	118 15.1	09.6				
21	133 14.8	·· 09.3				
22	148 14.6	08.9				
23	163 14.3	08.6				
24	178 14.0	−22 08.2				
code	−	+ 4				

Lat.	Sunrise	Twlt. begins	Moonrise 7	8	9	10
N °	h m	h m	h m	h m	h m	h m
72	▬	6 49	▬	▬	▬	▬
70	▬	6 42	5 58	▬	▬	▬
68	11 15	6 36	5 12	7 08	▬	▬
66	10 15	6 30	4 42	6 16	7 42	8 45
64	9 41	6 25	4 19	5 44	6 59	7 57
62	9 17	6 21	4 02	5 20	6 30	7 26
60	8 58	6 17	3 47	5 02	6 08	7 03
58	8 42	6 13	3 34	4 46	5 50	6 45
56	8 29	6 09	3 24	4 33	5 35	6 29
54	8 17	6 06	3 14	4 21	5 22	6 16
52	8 07	6 03	3 06	4 11	5 11	6 04
50	7 57	6 00	2 58	4 02	5 01	5 54
45	7 38	5 52	2 42	3 43	4 40	5 32
40	7 22	5 45	2 29	3 28	4 23	5 14
35	7 09	5 39	2 18	3 15	4 09	5 00
30	6 57	5 32	2 08	3 03	3 56	4 47
20	6 37	5 19	1 52	2 44	3 35	4 25
10	6 19	5 04	1 37	2 27	3 17	4 06
0	6 03	4 47	1 24	2 11	3 00	3 49
10	5 46	4 29	1 11	1 56	2 43	3 31
20	5 28	4 04	0 56	1 39	2 25	3 12
30	5 07	3 31	0 40	1 20	2 04	2 51
35	4 55	3 09	0 31	1 09	1 52	2 38
40	4 40	2 40	0 20	0 56	1 38	2 23
45	4 23	1 56	0 08	0 42	1 21	2 06
50	4 02	////	24 23	0 23	1 00	1 45
52	3 52	////	24 15	0 15	0 51	1 34
54	3 41	////	24 05	0 05	0 40	1 23
56	3 28	////	23 55	24 28	0 28	1 10
58	3 12	////	23 42	24 13	0 13	0 55
60	2 54	////	23 28	23 57	24 36	0 36
S						

Lat.	Sunset	Twlt. ends	Moonset 7	8	9	10
N °	h m	h m	h m	h m	h m	h m
72	▬	17 24	▬	▬	▬	▬
70	▬	17 31	9 00	▬	▬	▬
68	12 58	17 38	9 48	9 30	▬	▬
66	13 58	17 43	10 18	10 23	10 38	11 17
64	14 32	17 49	10 41	10 56	11 21	12 05
62	14 56	17 53	11 00	11 20	11 50	12 36
60	15 15	17 56	11 15	11 39	12 12	12 59
58	15 31	18 00	11 28	11 55	12 30	13 17
56	15 45	18 04	11 39	12 08	12 46	13 33
54	15 56	18 07	11 49	12 20	12 59	13 46
52	16 07	18 11	11 58	12 30	13 10	13 58
50	16 16	18 14	12 06	12 40	13 20	14 08
45	16 35	18 21	12 23	12 59	13 41	14 30
40	16 51	18 28	12 37	13 15	13 59	14 47
35	17 04	18 34	12 48	13 29	14 13	15 02
30	17 16	18 41	12 59	13 41	14 26	15 14
20	17 36	18 54	13 17	14 01	14 47	15 36
10	17 54	19 09	13 32	14 18	15 06	15 55
0	18 10	19 24	13 47	14 35	15 23	16 12
10	18 27	19 44	14 01	14 51	15 41	16 30
20	18 45	20 08	14 17	15 09	15 59	16 49
30	19 05	20 40	14 35	15 29	16 21	17 10
35	19 18	21 03	14 45	15 41	16 34	17 23
40	19 32	21 32	14 58	15 55	16 48	17 37
45	19 49	22 14	15 12	16 11	17 05	17 54
50	20 10	////	15 29	16 31	17 27	18 16
52	20 20	////	15 37	16 40	17 37	18 26
54	20 31	////	15 47	16 51	17 48	18 37
56	20 44	////	15 57	17 03	18 02	18 50
58	20 59	////	16 09	17 17	18 17	19 05
60	21 18	////	16 23	17 34	18 35	19 23
S						

GMT	Equation of Time (App.—Mean) 7	8	9
h	m s	m s	m s
0	− 5 45.9	− 6 12.2	− 6 38.0
6	− 5 52.5	− 6 18.7	− 6 44.4
12	− 5 59.1	− 6 25.2	− 6 50.7
18	− 6 05.7	− 6 31.6	− 6 57.1
24	− 6 12.2	− 6 38.0	− 7 03.3

DAY	GMT of Transit Meridian of Greenwich: Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
7	7 35	14 18	8 30	3 11	8 47
8	8 23	14 19	8 29	3 06	8 44
9	9 12	14 20	8 27	3 02	8 40
10	10 01	14 21	8 26	2 58	8 37

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.6	0.1	0.1
30	0.6	0.1	0.1
45	0.6	0.1	0.0
60	0.6	0.0	0.0
75	0.6	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	7	8	9
°	′	′	′
0	12.8	12.2	11.9
4	12.8	12.3	11.9
8	12.8	12.3	11.9
12	12.8	12.3	11.9
16	12.9	12.4	12.0
20	12.9	12.4	12.1
24	13.0	12.5	12.2
28	13.0	12.6	12.2
32	13.1	12.7	12.4
36	13.2	12.8	12.5
40	13.3	12.9	12.6
44	13.4	13.0	12.7
48	13.5	13.2	12.9
52	13.7	13.3	13.1
56	13.8	13.5	13.2
60	13.9	13.6	13.4
64	14.1	13.8	13.6
68	14.2	14.0	13.8
72	14.3	14.1	14.0
76	14.5	14.3	14.2
80	14.6	14.5	14.4
84	14.8	14.7	14.6
88	14.9	14.8	14.7
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	7	8	9
°	′	′	′
0	17.2	17.4	17.7
4	17.1	17.4	17.6
8	17.1	17.4	17.6
12	17.1	17.4	17.6
16	17.0	17.3	17.5
20	17.0	17.3	17.5
24	16.9	17.2	17.4
28	16.9	17.1	17.3
32	16.8	17.0	17.2
36	16.7	16.9	17.0
40	16.6	16.8	16.9
44	16.5	16.6	16.8
48	16.4	16.5	16.6
52	16.2	16.4	16.5
56	16.1	16.2	16.3
60	16.0	16.1	16.1
64	15.8	15.9	15.9
68	15.7	15.7	15.8
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.3	15.2	15.2
84	15.1	15.0	15.0
88	15.0	14.9	14.8
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.4 GHA	VENUS −3.4 Dec	MARS 1.7 GHA	MARS 1.7 Dec	JUPITER −2.0 GHA	JUPITER −2.0 Dec	SATURN 0.8 GHA	SATURN 0.8 Dec	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
10 0	108 30.3	144 52.6	−16 14.6	233 20.9	−19 03.6	315 23.5	+12 13.3	230 30.1	−18 09.8	214 48.1	114	−22 47.8 −	6
1	123 32.7	159 52.1	13.6	248 21.7	04.0	330 26.1	13.4	245 32.3	09.9	229 18.5	114	22 48.4 −	5
2	138 35.2	174 51.5	12.6	263 22.4	04.4	345 28.8	13.5	260 34.5	09.9	243 48.9	113	22 48.9 −	3
3	153 37.6	189 50.9	·· 11.6	278 23.2	·· 04.8	0 31.4	·· 13.5	275 36.8	·· 10.0	258 19.2	114	·22 49.2 −	2
4	168 40.1	204 50.4	10.6	293 24.0	05.2	15 34.0	13.6	290 39.0	10.0	272 49.6	114	22 49.4 −	2
5	183 42.6	219 49.8	09.6	308 24.8	05.6	30 36.7	13.7	305 41.2	10.1	287 20.0	114	22 49.6	0
6	198 45.0	234 49.2	−16 08.5	323 25.6	−19 06.0	45 39.3	+12 13.8	320 43.4	−18 10.1	301 50.4	114	−22 49.6+	1
7	213 47.5	249 48.7	07.5	338 26.4	06.4	60 41.9	13.8	335 45.7	10.1	316 20.8	113	22 49.5+	2
8	228 50.0	264 48.1	06.5	353 27.1	06.8	75 44.6	13.9	350 47.9	10.2	330 51.1	114	22 49.3+	3
9	243 52.4	279 47.6	·· 05.5	8 27.9	·· 07.2	90 47.2	·· 14.0	5 50.1	·· 10.2	345 21.5	114	·22 49.0+	4
10	258 54.9	294 47.0	04.5	23 28.7	07.6	105 49.9	14.0	20 52.4	10.3	359 51.9	114	22 48.6+	5
11	273 57.4	309 46.5	03.4	38 29.5	07.9	120 52.5	14.1	35 54.6	10.3	14 22.3	115	22 48.1+	6
12	288 59.8	324 45.9	−16 02.4	53 30.3	−19 08.3	135 55.1	+12 14.2	50 56.8	−18 10.4	28 52.8	114	−22 47.5+	7
13	304 02.3	339 45.3	01.4	68 31.1	08.7	150 57.8	14.3	65 59.0	10.4	43 23.2	114	22 46.8+	9
14	319 04.7	354 44.8	16 00.4	83 31.8	09.1	166 00.4	14.3	81 01.3	10.5	57 53.6	114	22 45.9+	9
15	334 07.2	9 44.2	·15 59.4	98 32.6	·· 09.5	181 03.0	·· 14.4	96 03.5	·· 10.5	72 24.0	115	·22 45.0+	10
16	349 09.7	24 43.7	58.3	113 33.4	09.9	196 05.7	14.5	111 05.7	10.5	86 54.5	114	22 44.0+	12
17	4 12.1	39 43.1	57.3	128 34.2	10.3	211 08.3	14.6	126 08.0	10.6	101 24.9	115	22 42.8+	12
18	19 14.6	54 42.6	−15 56.3	143 35.0	−19 10.7	226 10.9	+12 14.6	141 10.2	−18 10.6	115 55.4	114	−22 41.6+	14
19	34 17.1	69 42.0	55.2	158 35.7	11.1	241 13.6	14.7	156 12.4	10.7	130 25.8	115	22 40.2+	15
20	49 19.5	84 41.5	54.2	173 36.5	11.5	256 16.2	14.8	171 14.7	10.7	144 56.3	115	22 38.7+	15
21	64 22.0	99 40.9	·· 53.2	188 37.3	·· 11.9	271 18.9	·· 14.9	186 16.9	·· 10.8	159 26.8	115	·22 37.2+	17
22	79 24.5	114 40.4	52.2	203 38.1	12.2	286 21.5	14.9	201 19.1	10.8	173 57.3	115	22 35.5+	18
23	94 26.9	129 39.8	51.1	218 38.9	12.6	301 24.1	15.0	216 21.3	10.8	188 27.8	116	22 33.7+	19
11 0	109 29.4	144 39.3	−15 50.1	233 39.7	−19 13.0	316 26.8	+12 15.1	231 23.6	−18 10.9	202 58.4	115	−22 31.8+	20
1	124 31.9	159 38.7	49.1	248 40.4	13.4	331 29.4	15.2	246 25.8	10.9	217 28.9	116	22 29.8+	21
2	139 34.3	174 38.2	48.0	263 41.2	13.8	346 32.1	15.2	261 28.0	11.0	231 59.5	116	22 27.7+	22
3	154 36.8	189 37.6	·· 47.0	278 42.0	·· 14.2	1 34.7	·· 15.3	276 30.3	·· 11.0	246 30.1	115	·22 25.5+	23
4	169 39.2	204 37.1	46.0	293 42.8	14.6	16 37.3	15.4	291 32.5	11.1	261 00.6	117	22 23.2+	24
5	184 41.7	219 36.5	44.9	308 43.6	15.0	31 40.0	15.5	306 34.7	11.1	275 31.3	116	22 20.8+	25
6	199 44.2	234 36.0	−15 43.9	323 44.3	−19 15.4	46 42.6	+12 15.6	321 37.0	−18 11.1	290 01.9	116	−22 18.3+	26
7	214 46.6	249 35.4	42.9	338 45.1	15.7	61 45.3	15.6	336 39.2	11.2	304 32.5	117	22 15.7+	27
8	229 49.1	264 34.9	41.8	353 45.9	16.1	76 47.9	15.7	351 41.4	11.2	319 03.2	117	22 13.0+	28
9	244 51.6	279 34.3	·· 40.8	8 46.7	·· 16.5	91 50.5	·· 15.8	6 43.7	·· 11.3	333 33.9	117	·22 10.2+	29
10	259 54.0	294 33.8	39.8	23 47.5	16.9	106 53.2	15.9	21 45.9	11.3	348 04.6	117	22 07.3+	31
11	274 56.5	309 33.3	38.7	38 48.2	17.3	121 55.8	15.9	36 48.1	11.4	2 35.3	117	22 04.2+	31
12	289 59.0	324 32.7	−15 37.7	53 49.0	−19 17.7	136 58.5	+12 16.0	51 50.4	−18 11.4	17 06.0	118	−22 01.1+	32
13	305 01.4	339 32.2	36.6	68 49.8	18.1	152 01.1	16.1	66 52.6	11.4	31 36.8	118	21 57.9+	34
14	320 03.9	354 31.6	35.6	83 50.6	18.5	167 03.8	16.2	81 54.8	11.5	46 07.6	118	21 54.5+	34
15	335 06.4	9 31.1	·· 34.6	98 51.3	·· 18.8	182 06.4	·· 16.2	96 57.1	·· 11.5	60 38.4	118	·21 51.1+	35
16	350 08.8	24 30.6	33.5	113 52.1	19.2	197 09.0	16.3	111 59.3	11.6	75 09.2	119	21 47.6+	37
17	5 11.3	39 30.0	32.5	128 52.9	19.6	212 11.7	16.4	127 01.5	11.6	89 40.1	118	21 43.9+	37
18	20 13.7	54 29.5	−15 31.4	143 53.7	−19 20.0	227 14.3	+12 16.5	142 03.8	−18 11.7	104 10.9	119	−21 40.2+	38
19	35 16.2	69 28.9	30.4	158 54.5	20.4	242 17.0	16.6	157 06.0	11.7	118 41.8	120	21 36.4+	39
20	50 18.7	84 28.4	29.3	173 55.2	20.8	257 19.6	16.6	172 08.2	11.7	133 12.8	119	21 32.5+	41
21	65 21.1	99 27.9	·· 28.3	188 56.0	·· 21.1	272 22.3	·· 16.7	187 10.5	·· 11.8	147 43.7	120	·21 28.4+	41
22	80 23.6	114 27.3	27.3	203 56.8	21.5	287 24.9	16.8	202 12.7	11.8	162 14.7	120	21 24.3+	42
23	95 26.1	129 26.8	26.2	218 57.6	21.9	302 27.6	16.9	217 14.9	11.9	176 45.7	120	21 20.1+	44
12 0	110 28.5	144 26.3	−15 25.2	233 58.3	−19 22.3	317 30.2	+12 16.9	232 17.2	−18 11.9	191 16.7	121	−21 15.7+	44
1	125 31.0	159 25.7	24.1	248 59.1	22.7	332 32.8	17.0	247 19.4	12.0	205 47.8	121	21 11.3+	45
2	140 33.5	174 25.2	23.1	263 59.9	23.1	347 35.5	17.1	262 21.6	12.0	220 18.9	121	21 06.8+	46
3	155 35.9	189 24.7	·· 22.0	279 00.7	·· 23.4	2 38.1	·· 17.2	277 23.9	·· 12.0	234 50.0	121	·21 02.2+	47
4	170 38.4	204 24.1	21.0	294 01.5	23.8	17 40.8	17.3	292 26.1	12.1	249 21.1	122	20 57.5+	48
5	185 40.9	219 23.6	19.9	309 02.2	24.2	32 43.4	17.3	307 28.3	12.1	263 52.3	122	20 52.7+	49
6	200 43.3	234 23.1	−15 18.9	324 03.0	−19 24.6	47 46.1	+12 17.4	322 30.6	−18 12.2	278 23.5	122	−20 47.8+	50
7	215 45.8	249 22.5	17.8	339 03.8	25.0	62 48.7	17.5	337 32.8	12.2	292 54.7	122	20 42.8+	51
8	230 48.2	264 22.0	16.7	354 04.6	25.4	77 51.4	17.6	352 35.0	12.2	307 25.9	123	20 37.7+	52
9	245 50.7	279 21.5	·· 15.7	9 05.3	·· 25.7	92 54.0	·· 17.6	7 37.3	·· 12.3	321 57.2	123	·20 32.5+	53
10	260 53.2	294 20.9	14.6	24 06.1	26.1	107 56.7	17.7	22 39.5	12.3	336 28.5	124	20 27.2+	54
11	275 55.6	309 20.4	13.6	39 06.9	26.5	122 59.3	17.8	37 41.7	12.4	350 59.9	124	20 21.8+	54
12	290 58.1	324 19.9	−15 12.5	54 07.7	−19 26.9	138 02.0	+12 17.9	52 44.0	−18 12.4	5 31.3	124	−20 16.4+	56
13	306 00.6	339 19.4	11.5	69 08.4	27.3	153 04.6	18.0	67 46.2	12.5	20 02.7	124	20 10.8+	56
14	321 03.0	354 18.8	10.4	84 09.2	27.6	168 07.3	18.0	82 48.4	12.5	34 34.1	125	20 05.2+	58
15	336 05.5	9 18.3	·· 09.4	99 10.0	·· 28.0	183 09.9	·· 18.1	97 50.7	·· 12.5	49 05.6	125	·19 59.4+	58
16	351 08.0	24 17.8	08.3	114 10.8	28.4	198 12.6	18.2	112 52.9	12.6	63 37.1	125	19 53.6+	59
17	6 10.4	39 17.2	07.2	129 11.5	28.8	213 15.2	18.3	127 55.1	12.6	78 08.6	126	19 47.7+	60
18	21 12.9	54 16.7	−15 06.2	144 12.3	−19 29.2	228 17.9	+12 18.4	142 57.4	−18 12.7	92 40.2	126	−19 41.7+	61
19	36 15.3	69 16.2	05.1	159 13.1	29.5	243 20.5	18.4	157 59.6	12.7	107 11.8	126	19 35.6+	62
20	51 17.8	84 15.7	04.1	174 13.9	29.9	258 23.2	18.5	173 01.8	12.8	121 43.4	127	19 29.4+	63
21	66 20.3	99 15.2	·· 03.0	189 14.6	·· 30.3	273 25.8	·· 18.6	188 04.1	·· 12.8	136 15.1	127	·19 23.1+	63
22	81 22.7	114 14.6	01.9	204 15.4	30.7	288 28.5	18.7	203 06.3	12.8	150 46.8	127	19 16.8+	65
23	96 25.2	129 14.1	15 00.9	219 16.2	31.0	303 31.1	18.8	218 08.6	12.9	165 18.5	128	19 10.3+	65
24	111 27.7	144 13.6	−14 59.8	234 17.0	−19 31.4	318 33.8	+12 18.8	233 10.8	−18 12.9	179 50.3	127	−19 03.8+	66
code	−	− 5	+ 11	+ 8	− 4	+ 26	+ 1	+ 22	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
10 0	178 14.0	−22 08.2	7	Acamar	315 50.7	−40 29.0
1	193 13.8	07.9	5	Achernar	335 58.6	−57 27.8
2	208 13.5	07.5	30	Acrux	173 57.3	−62 51.2
3	223 13.3	07.1	19	Adhara	255 46.0	−28 54.8
4	238 13.0	06.8	10	Aldebaran	291 38.5	+16 25.4
5	253 12.7	06.4				
6	268 12.5	−22 06.1	32	Alioth	166 58.3	+56 11.5
7	283 12.2	05.7	34	Alkaid	153 32.8	+49 31.6
8	298 12.0	05.4	55	Al Na'ir	28 38.0	−47 10.6
9	313 11.7	05.0	15	Alnilam	276 29.7	− 1 13.8
10	328 11.4	04.7	25	Alphard	218 38.1	− 8 28.2
11	343 11.2	04.3				
12	358 10.9	−22 03.9	41	Alphecca	126 47.6	+26 51.5
13	13 10.7	03.6	1	Alpheratz	358 28.2	+28 51.1
14	28 10.4	03.2	51	Altair	62 50.5	+ 8 45.1
15	43 10.1	02.9	2	Ankaa	353 58.2	−42 32.8
16	58 09.9	02.5	42	Antares	113 19.3	−26 20.1
17	73 09.6	02.1				
18	88 09.4	−22 01.8	37	Arcturus	146 35.0	+19 24.4
19	103 09.1	01.4	43	Atria	109 00.3	−68 56.8
20	118 08.9	01.0	22	Avior	234 35.0	−59 22.1
21	133 08.6	00.7	13	Bellatrix	279 17.9	+ 6 18.6
22	148 08.4	22 00.3	16	Betelg'se	271 47.5	+ 7 24.0
23	163 08.1	21 59.9				
			17	Canopus	264 14.7	−52 40.4
11 0	178 07.8	−21 59.6	12	Capella	281 37.6	+45 57.4
1	193 07.6	59.2	53	Deneb	50 01.3	+45 07.5
2	208 07.3	58.8	28	Denebola	183 17.3	+14 48.8
3	223 07.1	58.4	4	Diphda	349 39.1	−18 13.7
4	238 06.8	58.1				
5	253 06.6	57.7	27	Dubhe	194 43.9	+61 58.9
6	268 06.3	−21 57.3	14	Elnath	279 06.7	+28 34.3
7	283 06.1	57.0	47	Eltanin	91 06.6	+51 29.5
8	298 05.8	56.6	54	Enif	34 29.6	+ 9 40.5
9	313 05.6	56.2	56	Fomalhaut	16 11.6	−29 51.4
10	328 05.3	55.8				
11	343 05.0	55.4	31	Gacrux	172 48.8	−56 51.9
12	358 04.8	−21 55.1	29	Gienah	176 36.5	−17 17.9
13	13 04.5	54.7	35	Hadar	149 49.2	−60 09.5
14	28 04.3	54.3	6	Hamal	328 49.3	+23 15.5
15	43 04.0	53.9	48	Kaus Aust.	84 41.2	−34 24.4
16	58 03.8	53.6				
17	73 03.5	53.2	40	Kochab	137 18.5	+74 19.8
18	88 03.3	−21 52.8	57	Markab	14 21.4	+14 58.3
19	103 03.0	52.4	8	Menkar	314 59.9	+ 3 55.1
20	118 02.8	52.0	36	Menkent	148 58.5	−36 09.2
21	133 02.5	51.6	24	Miapl'dus	221 48.1	−69 32.1
22	148 02.3	51.3				
23	163 02.0	50.9	9	Mirfak	309 41.7	+49 42.6
			50	Nunki	76 52.0	−26 21.1
12 0	178 01.8	−21 50.5	52	Peacock	54 27.5	−56 52.7
1	193 01.5	50.1	21	Pollux	244 19.9	+28 07.9
2	208 01.3	49.7	20	Procyon	245 44.4	+ 5 20.2
3	223 01.0	49.3				
4	238 00.8	48.9	46	R'alhague	96 46.7	+12 35.4
5	253 00.5	48.5	26	Regulus	208 29.0	+12 10.8
6	268 00.3	−21 48.1	11	Rigel	281 53.1	− 8 15.2
7	283 00.0	47.8	38	Rigil Kent.	140 50.8	−60 39.2
8	297 59.8	47.4	44	Sabik	103 02.2	−15 40.3
9	312 59.6	47.0				
10	327 59.3	46.6	3	Schedar	350 29.8	+56 18.2
11	342 59.1	46.2	45	Shaula	97 20.7	−37 04.3
12	357 58.8	−21 45.8	18	Sirius	259 11.3	−16 39.4
13	12 58.6	45.4	33	Spica	159 16.6	−10 56.0
14	27 58.3	45.0	23	Suhail	223 23.7	−43 15.3
15	42 58.1	44.6				
16	57 57.8	44.2	49	Vega	81 08.5	+38 44.5
17	72 57.6	43.8	39	Zub'g'bi	137 53.2	−15 51.6
18	87 57.3	−21 43.4				
19	102 57.1	43.0				
20	117 56.9	42.6				
21	132 56.6	42.2				
22	147 56.4	41.8				
23	162 56.1	41.4				
24	177 55.9	−21 41.0				
code	−	+ 4				

Lat.	Sunrise	Twlt. begins	Moonrise 10	11	12	13
N °	h m	h m	h m	h m	h m	h m
72	▬	6 45	▬	▬	▬	11 45
70	▬	6 38	▬	▬	▬	10 31
68	10 58	6 33	▬	▬	10 06	9 53
66	10 07	6 28	8 45	9 13	9 23	9 27
64	9 36	6 23	7 57	8 33	8 54	9 06
62	9 13	6 19	7 26	8 06	8 32	8 49
60	8 55	6 16	7 03	7 44	8 14	8 35
58	8 39	6 12	6 45	7 27	7 59	8 23
56	8 26	6 08	6 29	7 12	7 47	8 13
54	8 15	6 05	6 16	7 00	7 35	8 04
52	8 05	6 02	6 04	6 49	7 25	7 56
50	7 56	5 59	5 54	6 39	7 17	7 48
45	7 37	5 52	5 32	6 18	6 58	7 32
40	7 22	5 46	5 14	6 01	6 42	7 19
35	7 09	5 39	5 00	5 47	6 29	7 08
30	6 57	5 32	4 47	5 34	6 18	6 58
20	6 37	5 19	4 25	5 13	5 59	6 41
10	6 20	5 05	4 06	4 55	5 42	6 27
0	6 04	4 50	3 49	4 38	5 26	6 13
10	5 48	4 30	3 31	4 20	5 10	5 59
20	5 30	4 06	3 12	4 02	4 53	5 44
30	5 10	3 34	2 51	3 41	4 33	5 27
35	4 58	3 12	2 38	3 28	4 22	5 17
40	4 44	2 43	2 23	3 14	4 08	5 06
45	4 27	2 03	2 06	2 57	3 53	4 52
50	4 07	////	1 45	2 36	3 34	4 36
52	3 57	////	1 34	2 26	3 24	4 28
54	3 46	////	1 23	2 15	3 14	4 19
56	3 33	////	1 10	2 02	3 03	4 10
58	3 18	////	0 55	1 47	2 49	3 59
60	3 00	////	0 36	1 29	2 33	3 46
S						

Lat.	Sunset	Twlt. ends	Moonset 10	11	12	13
N °	h m	h m	h m	h m	h m	h m
72	▬	17 30	▬	▬	▬	13 17
70	▬	17 37	▬	▬	▬	14 29
68	13 18	17 44	▬	▬	13 17	15 06
66	14 09	17 49	11 17	12 30	13 59	15 32
64	14 40	17 53	12 05	13 10	14 28	15 52
62	15 03	17 57	12 36	13 37	14 49	16 08
60	15 21	18 01	12 59	13 58	15 07	16 22
58	15 36	18 04	13 17	14 15	15 21	16 33
56	15 49	18 07	13 33	14 29	15 34	16 43
54	16 01	18 11	13 46	14 42	15 45	16 52
52	16 11	18 14	13 58	14 53	15 54	16 59
50	16 20	18 17	14 08	15 03	16 03	17 06
45	16 39	18 24	14 30	15 23	16 21	17 21
40	16 54	18 30	14 47	15 40	16 36	17 34
35	17 07	18 37	15 02	15 54	16 48	17 44
30	17 19	18 43	15 14	16 06	16 59	17 53
20	17 38	18 56	15 36	16 26	17 17	18 09
10	17 55	19 10	15 55	16 44	17 34	18 22
0	18 11	19 25	16 12	17 01	17 49	18 35
10	18 28	19 45	16 30	17 18	18 04	18 47
20	18 45	20 08	16 49	17 35	18 19	19 01
30	19 06	20 40	17 10	17 56	18 38	19 16
35	19 18	21 02	17 23	18 08	18 48	19 25
40	19 31	21 29	17 37	18 21	19 00	19 35
45	19 48	22 10	17 54	18 37	19 14	19 46
50	20 08	23 45	18 16	18 57	19 32	20 00
52	20 18	////	18 26	19 07	19 40	20 07
54	20 29	////	18 37	19 17	19 49	20 14
56	20 42	////	18 50	19 29	19 59	20 22
58	20 56	////	19 05	19 43	20 10	20 31
60	21 14	////	19 23	19 59	20 24	20 42
S						

GMT	Equation of Time (App. − Mean) 10	11	12
h	m s	m s	m s
0	− 7 03.3	− 7 28.1	− 7 52.4
6	− 7 09.6	− 7 34.2	− 7 58.3
12	− 7 15.8	− 7 40.3	− 8 04.3
18	− 7 22.0	− 7 46.4	− 8 10.1
24	− 7 28.1	− 7 52.4	− 8 16.0

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
10	10 01	14 21	8 26	2 58	8 37
11	10 49	14 22	8 25	2 54	8 33
12	11 37	14 23	8 24	2 50	8 30
13	12 24	14 24	8 22	2 45	8 26

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.6	0.1	0.1
30	0.6	0.1	0.1
45	0.6	0.1	0.0
60	0.6	0.0	0.0
75	0.6	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	10	11	12
°	′	′	′
0	11.7	11.7	11.7
4	11.7	11.7	11.7
8	11.8	11.8	11.8
12	11.8	11.8	11.8
16	11.9	11.9	11.9
20	12.0	12.0	12.0
24	12.0	12.0	12.0
28	12.1	12.1	12.1
32	12.2	12.2	12.2
36	12.4	12.4	12.4
40	12.5	12.5	12.5
44	12.6	12.6	12.6
48	12.8	12.8	12.8
52	13.0	13.0	13.0
56	13.1	13.1	13.1
60	13.3	13.3	13.3
64	13.5	13.5	13.5
68	13.7	13.7	13.7
72	13.9	13.9	13.9
76	14.1	14.1	14.1
80	14.3	14.3	14.3
84	14.5	14.5	14.5
88	14.7	14.7	14.7
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	10	11	12
°	′	′	′
0	17.7	17.7	17.7
4	17.7	17.7	17.7
8	17.7	17.7	17.7
12	17.6	17.6	17.6
16	17.6	17.6	17.6
20	17.5	17.5	17.5
24	17.4	17.4	17.4
28	17.3	17.3	17.3
32	17.2	17.2	17.2
36	17.1	17.1	17.1
40	17.0	17.0	17.0
44	16.8	16.8	16.8
48	16.7	16.7	16.7
52	16.5	16.5	16.5
56	16.3	16.3	16.3
60	16.1	16.1	16.1
64	16.0	16.0	16.0
68	15.8	15.8	15.8
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.2
84	14.9	14.9	14.9
88	14.8	14.8	14.8
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.4 GHA	VENUS −3.4 Dec.	MARS 1.6 GHA	MARS 1.6 Dec.	JUPITER −2.0 GHA	JUPITER −2.0 Dec.	SATURN 0.8 GHA	SATURN 0.8 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
13 0	111 27.7	144 13.6	−14 59.8	234 17.0	−19 31.4	318 33.8	+12 18.8	233 10.8	−18 12.9	179 50.3	127	−19 03.8	+ 66
1	126 30.1	159 13.1	58.7	249 17.7	31.8	333 36.4	18.9	248 13.0	13.0	194 22.0	129	18 57.2	+ 68
2	141 32.6	174 12.5	57.7	264 18.5	32.2	348 39.1	19.0	263 15.3	13.0	208 53.9	128	18 50.4	+ 67
3	156 35.1	189 12.0	·· 56.6	279 19.3	·· 32.6	3 41.7	·· 19.1	278 17.5	·· 13.0	223 25.7	129	·18 43.7	+ 69
4	171 37.5	204 11.5	55.5	294 20.1	32.9	18 44.4	19.2	293 19.7	13.1	237 57.6	130	18 36.8	+ 70
5	186 40.0	219 11.0	54.5	309 20.8	33.3	33 47.1	19.2	308 22.0	13.1	252 29.6	129	18 29.8	+ 70
6	201 42.5	234 10.5	−14 53.4	324 21.6	−19 33.7	48 49.7	+12 19.3	323 24.2	−18 13.2	267 01.5	130	−18 22.8	+ 71
7	216 44.9	249 10.0	52.3	339 22.4	34.1	63 52.4	19.4	338 26.4	13.2	281 33.5	131	18 15.7	+ 72
8	231 47.4	264 09.4	51.3	354 23.2	34.4	78 55.0	19.5	353 28.7	13.3	296 05.6	130	18 08.5	+ 73
9	246 49.8	279 08.9	·· 50.2	9 23.9	·· 34.8	93 57.7	·· 19.6	8 30.9	·· 13.3	310 37.6	131	·18 01.2	+ 74
10	261 52.3	294 08.4	49.1	24 24.7	35.2	109 00.3	19.6	23 33.2	13.3	325 09.7	132	17 53.8	+ 74
11	276 54.8	309 07.9	48.0	39 25.5	35.6	124 03.0	19.7	38 35.4	13.4	339 41.9	131	17 46.4	+ 76
12	291 57.2	324 07.4	−14 47.0	54 26.2	−19 35.9	139 05.6	+12 19.8	53 37.6	−18 13.4	354 14.0	133	−17 38.8	+ 76
13	306 59.7	339 06.9	45.9	69 27.0	36.3	154 08.3	19.9	68 39.9	13.5	8 46.3	132	17 31.2	+ 77
14	322 02.2	354 06.4	44.8	84 27.8	36.7	169 11.0	20.0	83 42.1	13.5	23 18.5	133	17 23.5	+ 77
15	337 04.6	9 05.8	·· 43.8	99 28.6	·· 37.0	184 13.6	·· 20.0	98 44.3	·· 13.5	37 50.8	133	·17 15.8	+ 79
16	352 07.1	24 05.3	42.7	114 29.3	37.4	199 16.3	20.1	113 46.6	13.6	52 23.1	133	17 07.9	+ 79
17	7 09.6	39 04.8	41.6	129 30.1	37.8	214 18.9	20.2	128 48.8	13.6	66 55.4	134	17 00.0	+ 80
18	22 12.0	54 04.3	−14 40.5	144 30.9	−19 38.2	229 21.6	+12 20.3	143 51.1	−18 13.7	81 27.8	134	−16 52.0	+ 80
19	37 14.5	69 03.8	39.4	159 31.6	38.5	244 24.2	20.4	158 53.3	13.7	96 00.2	134	16 44.0	+ 82
20	52 17.0	84 03.3	38.4	174 32.4	38.9	259 26.9	20.5	173 55.5	13.7	110 32.6	135	16 35.8	+ 82
21	67 19.4	99 02.8	·· 37.3	189 33.2	·· 39.3	274 29.6	·· 20.5	188 57.8	·· 13.8	125 05.1	135	·16 27.6	+ 83
22	82 21.9	114 02.3	36.2	204 34.0	39.7	289 32.2	20.6	204 00.0	13.8	139 37.6	136	16 19.3	+ 83
23	97 24.3	129 01.8	35.1	219 34.7	40.0	304 34.9	20.7	219 02.3	13.9	154 10.2	135	16 11.0	+ 85
14 0	112 26.8	144 01.3	−14 34.1	234 35.5	−19 40.4	319 37.5	+12 20.8	234 04.5	−18 13.9	168 42.7	136	−16 02.5	+ 85
1	127 29.3	159 00.7	33.0	249 36.3	40.8	334 40.2	20.9	249 06.7	13.9	183 15.3	137	15 54.0	+ 85
2	142 31.7	174 00.2	31.9	264 37.0	41.1	349 42.9	21.0	264 09.0	14.0	197 48.0	137	15 45.5	+ 87
3	157 34.2	188 59.7	·· 30.8	279 37.8	·· 41.5	4 45.5	·· 21.0	279 11.2	·· 14.0	212 20.7	137	·15 36.8	+ 87
4	172 36.7	203 59.2	29.7	294 38.6	41.9	19 48.2	21.1	294 13.4	14.1	226 53.4	137	15 28.1	+ 88
5	187 39.1	218 58.7	28.6	309 39.3	42.3	34 50.8	21.2	309 15.7	14.1	241 26.1	138	15 19.3	+ 88
6	202 41.6	233 58.2	−14 27.6	324 40.1	−19 42.6	49 53.5	+12 21.3	324 17.9	−18 14.2	255 58.9	138	−15 10.5	+ 89
7	217 44.1	248 57.7	26.5	339 40.9	43.0	64 56.2	21.4	339 20.2	14.2	270 31.7	138	15 01.6	+ 90
8	232 46.5	263 57.2	25.4	354 41.7	43.4	79 58.8	21.4	354 22.4	14.2	285 04.5	139	14 52.6	+ 91
9	247 49.0	278 56.7	·· 24.3	9 42.4	·· 43.7	95 01.5	·· 21.5	9 24.6	·· 14.3	299 37.4	139	·14 43.5	+ 91
10	262 51.5	293 56.2	23.2	24 43.2	44.1	110 04.1	21.6	24 26.9	14.3	314 10.3	139	14 34.4	+ 92
11	277 53.9	308 55.7	22.1	39 44.0	44.5	125 06.8	21.7	39 29.1	14.4	328 43.2	139	14 25.2	+ 92
12	292 56.4	323 55.2	−14 21.0	54 44.7	−19 44.8	140 09.5	+12 21.8	54 31.4	−18 14.4	343 16.1	140	−14 16.0	+ 93
13	307 58.8	338 54.7	19.9	69 45.5	45.2	155 12.1	21.9	69 33.6	14.4	357 49.1	140	14 06.7	+ 94
14	323 01.3	353 54.2	18.9	84 46.3	45.6	170 14.8	22.0	84 35.9	14.5	12 22.1	141	13 57.3	+ 94
15	338 03.8	8 53.7	·· 17.8	99 47.0	·· 45.9	185 17.5	·· 22.0	99 38.1	·· 14.5	26 55.2	141	·13 47.9	+ 95
16	353 06.2	23 53.2	16.7	114 47.8	46.3	200 20.1	22.1	114 40.3	14.6	41 28.3	141	13 38.4	+ 96
17	8 08.7	38 52.7	15.6	129 48.6	46.7	215 22.8	22.2	129 42.6	14.6	56 01.4	141	13 28.8	+ 96
18	23 11.2	53 52.2	−14 14.5	144 49.3	−19 47.0	230 25.5	+12 22.3	144 44.8	−18 14.6	70 34.5	142	−13 19.2	+ 97
19	38 13.6	68 51.7	13.4	159 50.1	47.4	245 28.1	22.4	159 47.1	14.7	85 07.7	141	13 09.5	+ 97
20	53 16.1	83 51.2	12.3	174 50.9	47.8	260 30.8	22.5	174 49.3	14.7	99 40.8	142	12 59.8	+ 98
21	68 18.6	98 50.7	·· 11.2	189 51.6	·· 48.1	275 33.4	·· 22.5	189 51.5	·· 14.8	114 14.0	143	·12 50.0	+ 98
22	83 21.0	113 50.2	10.1	204 52.4	48.5	290 36.1	22.6	204 53.8	14.8	128 47.3	143	12 40.2	+ 99
23	98 23.5	128 49.7	09.0	219 53.2	48.9	305 38.8	22.7	219 56.0	14.8	143 20.6	142	12 30.3	+100
15 0	113 25.9	143 49.3	−14 07.9	234 54.0	−19 49.2	320 41.4	+12 22.8	234 58.3	−18 14.9	157 53.8	144	−12 20.3	+100
1	128 28.4	158 48.8	06.8	249 54.7	49.6	335 44.1	22.9	250 00.5	14.9	172 27.2	143	12 10.3	+101
2	143 30.9	173 48.3	05.7	264 55.5	50.0	350 46.8	23.0	265 02.7	15.0	187 00.5	144	12 00.2	+101
3	158 33.3	188 47.8	·· 04.6	279 56.3	·· 50.3	5 49.4	·· 23.0	280 05.0	·· 15.0	201 33.9	144	·11 50.1	+102
4	173 35.8	203 47.3	03.5	294 57.0	50.7	20 52.1	23.1	295 07.2	15.0	216 07.3	144	11 39.9	+102
5	188 38.3	218 46.8	02.4	309 57.8	51.0	35 54.8	23.2	310 09.5	15.1	230 40.7	144	11 29.7	+103
6	203 40.7	233 46.3	−14 01.3	324 58.6	−19 51.4	50 57.4	+12 23.3	325 11.7	−18 15.1	245 14.1	145	−11 19.4	+103
7	218 43.2	248 45.8	14 00.2	339 59.3	51.8	66 00.1	23.4	340 14.0	15.2	259 47.6	144	11 09.1	+104
8	233 45.7	263 45.3	13 59.1	355 00.1	52.1	81 02.8	23.5	355 16.2	15.2	274 21.0	145	10 58.7	+104
9	248 48.1	278 44.8	·· 58.0	10 00.9	·· 52.5	96 05.4	·· 23.6	10 18.4	·· 15.2	288 54.5	146	·10 48.3	+105
10	263 50.6	293 44.3	56.9	25 01.6	52.9	111 08.1	23.6	25 20.7	15.3	303 28.1	145	10 37.8	+106
11	278 53.1	308 43.9	55.8	40 02.4	53.2	126 10.8	23.7	40 22.9	15.3	318 01.6	146	10 27.2	+105
12	293 55.5	323 43.4	−13 54.7	55 03.2	−19 53.6	141 13.5	+12 23.8	55 25.2	−18 15.4	332 35.2	146	−10 16.7	+107
13	308 58.0	338 42.9	53.6	70 03.9	54.0	156 16.1	23.9	70 27.4	15.4	347 08.8	146	10 06.0	+106
14	324 00.4	353 42.4	52.5	85 04.7	54.3	171 18.8	24.0	85 29.7	15.4	1 42.4	146	9 55.4	+108
15	339 02.9	8 41.9	·· 51.4	100 05.4	·· 54.7	186 21.5	·· 24.1	100 31.9	·· 15.5	16 16.0	146	· 9 44.6	+107
16	354 05.4	23 41.4	50.3	115 06.2	55.0	201 24.1	24.2	115 34.1	15.5	30 49.6	147	9 33.9	+108
17	9 07.8	38 41.0	49.2	130 07.0	55.4	216 26.8	24.2	130 36.4	15.6	45 23.3	146	9 23.1	+109
18	24 10.3	53 40.5	−13 48.1	145 07.7	−19 55.8	231 29.5	+12 24.3	145 38.6	−18 15.6	59 56.9	147	− 9 12.2	+109
19	39 12.8	68 40.0	47.0	160 08.5	56.1	246 32.1	24.4	160 40.9	15.6	74 30.6	147	9 01.3	+109
20	54 15.2	83 39.5	45.9	175 09.3	56.5	261 34.8	24.5	175 43.1	15.7	89 04.3	147	8 50.4	+110
21	69 17.7	98 39.0	·· 44.8	190 10.0	·· 56.8	276 37.5	·· 24.6	190 45.4	·· 15.7	103 38.0	148	· 8 39.4	+110
22	84 20.2	113 38.5	43.6	205 10.8	57.2	291 40.2	24.7	205 47.6	15.8	118 11.8	147	8 28.4	+111
23	99 22.6	128 38.1	42.5	220 11.6	57.5	306 42.8	24.8	220 49.9	15.8	132 45.5	148	8 17.3	+111
24	114 25.1	143 37.6	−13 41.4	235 12.3	−19 57.9	321 45.5	+12 24.9	235 52.1	−18 15.8	147 19.3	147	− 8 06.2	+111
code	—	− 5	+ 11	+ 8	− 4	+ 26	+ 1	+ 22	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
13 0	177 55.9	−21 41.0	7	Acamar	315 50.8	−40 29.0
1	192 55.6	40.6	5	Achernar	335 58.6	−57 27.8
2	207 55.4	40.2	30	Acrux	173 57.3	−62 51.2
3	222 55.2	·· 39.8	19	Adhara	255 46.0	−28 54.8
4	237 54.9	39.3	10	Aldebaran	291 38.5	+16 25.4
5	252 54.7	38.9				
6	267 54.4	−21 38.5	32	Alioth	166 58.2	+56 11.5
7	282 54.2	38.1	34	Alkaid	153 32.7	+49 31.6
8	297 53.9	37.7	55	Al Na'ir	28 38.0	−47 10.6
9	312 53.7	·· 37.3	15	Alnilam	276 29.7	− 1 13.8
10	327 53.5	36.9	25	Alphard	218 38.0	− 8 28.2
11	342 53.2	36.5				
12	357 53.0	−21 36.1	41	Alphecca	126 47.6	+26 51.5
13	12 52.7	35.7	1	Alpheratz	358 28.2	+28 51.1
14	27 52.5	35.2	51	Altair	62 50.5	+ 8 45.1
15	42 52.3	·· 34.8	2	Ankaa	353 58.2	−42 32.8
16	57 52.0	34.4	42	Antares	113 19.3	−26 20.1
17	72 51.8	34.0				
18	87 51.5	−21 33.6	37	Arcturus	146 35.0	+19 24.4
19	102 51.3	33.2	43	Atria	109 00.2	−68 56.8
20	117 51.1	32.7	22	Avior	234 35.0	−59 22.1
21	132 50.8	·· 32.3	13	Bellatrix	279 17.9	+ 6 18.6
22	147 50.6	31.9	16	Betelg'se	271 47.5	+ 7 24.0
23	162 50.4	31.5				
			17	Canopus	264 14.7	−52 40.4
14 0	177 50.1	−21 31.1	12	Capella	281 37.6	+45 57.4
1	192 49.9	30.6	53	Deneb	50 01.3	+45 07.5
2	207 49.7	30.2	28	Denebola	183 17.3	+14 48.8
3	222 49.4	·· 29.8	4	Diphda	349 39.1	−18 13.7
4	237 49.2	29.4				
5	252 48.9	28.9	27	Dubhe	194 43.9	+61 58.9
6	267 48.7	−21 28.5	14	Elnath	279 06.7	+28 34.3
7	282 48.5	28.1	47	Eltanin	91 06.6	+51 29.5
8	297 48.2	27.7	54	Enif	34 29.6	+ 9 40.5
9	312 48.0	·· 27.2	56	Fomalhaut	16 11.6	−29 51.4
10	327 47.8	26.8				
11	342 47.5	26.4	31	Gacrux	172 48.8	−56 51.9
12	357 47.3	−21 25.9	29	Gienah	176 36.5	−17 17.9
13	12 47.1	25.5	35	Hadar	149 49.1	−60 09.5
14	27 46.8	25.1	6	Hamal	328 49.3	+23 15.5
15	42 46.6	·· 24.6	48	Kaus Aust.	84 41.2	−34 24.4
16	57 46.4	24.2				
17	72 46.1	23.8	40	Kochab	137 18.4	+74 19.7
18	87 45.9	−21 23.3	57	Markab	14 21.4	+14 58.2
19	102 45.7	22.9	8	Menkar	314 59.9	+ 3 55.1
20	117 45.4	22.5	36	Menkent	148 58.4	−36 09.2
21	132 45.2	·· 22.0	24	Miapl'dus	221 48.1	−69 32.1
22	147 45.0	21.6				
23	162 44.8	21.2	9	Mirfak	309 41.8	+49 42.6
			50	Nunki	76 52.0	−26 21.1
15 0	177 44.5	−21 20.7	52	Peacock	54 27.5	−56 52.7
1	192 44.3	20.3	21	Pollux	244 19.9	+28 07.9
2	207 44.1	19.8	20	Procyon	245 44.4	+ 5 20.2
3	222 43.8	·· 19.4				
4	237 43.6	18.9	46	R'alhague	96 46.7	+12 35.4
5	252 43.4	18.5	26	Regulus	208 29.0	+12 10.7
6	267 43.2	−21 18.1	11	Rigel	281 53.1	− 8 15.2
7	282 42.9	17.6	38	Rigil Kent.	140 50.8	−60 39.2
8	297 42.7	17.2	44	Sabik	103 02.2	−15 40.3
9	312 42.5	·· 16.7				
10	327 42.2	16.3	3	Schedar	350 29.8	+56 18.1
11	342 42.0	15.8	45	Shaula	97 20.7	−37 04.3
12	357 41.8	−21 15.4	18	Sirius	259 11.3	−16 39.4
13	12 41.6	14.9	33	Spica	159 16.6	−10 56.0
14	27 41.3	14.5	23	Suhail	223 23.7	−43 15.3
15	42 41.1	·· 14.0				
16	57 40.9	13.6	49	Vega	81 08.5	+38 44.5
17	72 40.7	13.1	39	Zub'g'bi	137 53.2	−15 51.6
18	87 40.4	−21 12.7				
19	102 40.2	12.2				
20	117 40.0	11.8				
21	132 39.8	·· 11.3				
22	147 39.5	10.9				
23	162 39.3	10.4				
24	177 39.1	−21 10.0				
code	—	+ 4				

Lat. N°	Sunrise h m	Twlt. begins h m
72	▬	6 40
70	▬	6 34
68	10 42	6 29
66	9 59	6 25
64	9 30	6 21
62	9 08	6 17
60	8 51	6 13
58	8 36	6 10
56	8 23	6 06
54	8 13	6 03
52	8 03	6 01
50	7 54	5 58
45	7 36	5 51
40	7 21	5 45
35	7 08	5 39
30	6 57	5 33
20	6 38	5 20
10	6 21	5 07
0	6 05	4 51
10	5 49	4 33
20	5 32	4 09
30	5 12	3 37
35	5 00	3 16
40	4 47	2 49
45	4 30	2 08
50	4 10	0 45
52	4 01	////
54	3 50	////
56	3 38	////
58	3 24	////
60	3 07	////
S		

Lat. N°	Sunset h m	Twlt. ends h m
72	▬	17 38
70	▬	17 44
68	13 36	17 50
66	14 20	17 55
64	14 48	17 58
62	15 10	18 02
60	15 28	18 06
58	15 42	18 09
56	15 55	18 12
54	16 06	18 15
52	16 15	18 17
50	16 24	18 20
45	16 42	18 27
40	16 57	18 33
35	17 10	18 39
30	17 21	18 45
20	17 40	18 58
10	17 57	19 11
0	18 13	19 27
10	18 28	19 44
20	18 46	20 08
30	19 05	20 39
35	19 17	21 00
40	19 31	21 28
45	19 47	22 07
50	20 06	23 25
52	20 16	////
54	20 27	////
56	20 39	////
58	20 53	////
60	21 10	////
S		

Moonrise	13	14	15	16
	h m	h m	h m	h m
	11 45	10 37	10 09	9 48
	10 31	10 07	9 52	9 39
	9 53	9 45	9 38	9 32
	9 27	9 27	9 27	9 26
	9 06	9 13	9 18	9 21
	8 49	9 01	9 09	9 16
	8 35	8 51	9 02	9 12
	8 23	8 42	8 56	9 09
	8 13	8 34	8 51	9 06
	8 04	8 27	8 46	9 03
	7 56	8 20	8 41	9 00
	7 48	8 14	8 37	8 58
	7 32	8 02	8 28	8 53
	7 19	7 52	8 21	8 48
	7 08	7 43	8 15	8 45
	6 58	7 35	8 09	8 41
	6 41	7 21	7 59	8 36
	6 27	7 09	7 51	8 31
	6 13	6 58	7 42	8 26
	5 59	6 47	7 34	8 21
	5 44	6 35	7 26	8 16
	5 27	6 21	7 16	8 10
	5 17	6 13	7 10	8 07
	5 06	6 04	7 03	8 03
	4 52	5 54	6 56	7 59
	4 36	5 40	6 46	7 53
	4 28	5 34	6 42	7 51
	4 19	5 28	6 38	7 48
	4 10	5 20	6 32	7 45
	3 59	5 12	6 26	7 42
	3 46	5 02	6 20	7 38

Moonset	13	14	15	16
	h m	h m	h m	h m
	13 17	15 59	17 59	19 50
	14 29	16 27	18 14	19 57
	15 06	16 48	18 26	20 02
	15 32	17 05	18 36	20 06
	15 52	17 18	18 44	20 10
	16 08	17 29	18 51	20 13
	16 22	17 39	18 57	20 16
	16 33	17 47	19 02	20 18
	16 43	17 55	19 07	20 20
	16 52	18 01	19 11	20 22
	16 59	18 07	19 15	20 24
	17 06	18 12	19 19	20 26
	17 21	18 23	19 26	20 29
	17 34	18 33	19 32	20 32
	17 44	18 41	19 37	20 34
	17 53	18 48	19 42	20 37
	18 09	19 00	19 50	20 40
	18 22	19 10	19 57	20 44
	18 35	19 20	20 03	20 47
	18 47	19 29	20 10	20 50
	19 01	19 40	20 17	20 53
	19 16	19 51	20 24	20 56
	19 25	19 58	20 29	20 58
	19 35	20 06	20 34	21 01
	19 46	20 14	20 40	21 03
	20 00	20 25	20 46	21 06
	20 07	20 30	20 50	21 08
	20 14	20 35	20 53	21 09
	20 22	20 41	20 57	21 11
	20 31	20 48	21 01	21 13
	20 42	20 55	21 06	21 15

GMT	Equation of Time (App. Mean) 13	14	15
h	m s	m s	m s
0	− 8 16.0	− 8 39.0	− 9 01.4
6	− 8 21.8	− 8 44.7	− 9 06.9
12	− 8 27.6	− 8 50.3	− 9 12.4
18	− 8 33.3	− 8 55.9	− 9 17.8
24	− 8 39.0	− 9 01.4	− 9 23.2

GMT of Transit Meridian of Greenwich DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
13	12 24	14 24	8 22	2 45	8 26
14	13 09	14 24	8 21	2 41	8 23
15	13 53	14 25	8 20	2 37	8 19
16	14 36	14 26	8 19	2 33	8 15

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.6	0.1	0.1
30	0.6	0.1	0.1
45	0.6	0.1	0.0
60	0.6	0.0	0.0
75	0.6	0.0	0.0
90	0.6	0.0	0.0

Moon's Lower Limb Add

Alt.	13	14	15
°	′	′	′
0	12.0	12.2	12.6
4	12.0	12.3	12.6
8	12.0	12.3	12.7
12	12.1	12.3	12.7
16	12.1	12.4	12.7
20	12.2	12.4	12.8
24	12.3	12.5	12.9
28	12.4	12.6	12.9
32	12.5	12.7	13.0
36	12.6	12.8	13.1
40	12.7	12.9	13.2
44	12.8	13.0	13.3
48	13.0	13.2	13.4
52	13.1	13.3	13.6
56	13.3	13.5	13.7
60	13.5	13.6	13.8
64	13.6	13.8	14.0
68	13.8	14.0	14.1
72	14.0	14.1	14.3
76	14.2	14.3	14.4
80	14.4	14.5	14.6
84	14.6	14.7	14.8
88	14.7	14.8	14.9
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	13	14	15
°	′	′	′
0	17.6	17.4	17.2
4	17.6	17.4	17.2
8	17.5	17.4	17.2
12	17.5	17.4	17.2
16	17.5	17.3	17.1
20	17.4	17.3	17.1
24	17.3	17.2	17.0
28	17.2	17.1	16.9
32	17.1	17.0	16.8
36	17.0	16.9	16.7
40	16.9	16.8	16.6
44	16.7	16.6	16.5
48	16.6	16.5	16.4
52	16.4	16.4	16.3
56	16.3	16.2	16.1
60	16.1	16.1	16.0
64	15.9	15.9	15.9
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.2
84	15.0	15.0	15.1
88	14.8	14.9	15.0
90			

Subtract from table, back cover

New Moon

GMT	♈ GHA	VENUS −3.4 GHA	VENUS −3.4 Dec.	MARS 1.6 GHA	MARS 1.6 Dec.	JUPITER −2.0 GHA	JUPITER −2.0 Dec.	SATURN 0.8 GHA	SATURN 0.8 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
16 0	114 25.1	143 37.6	−13 41.4	235 12.3	−19 57.9	321 45.5	+12 24.9	235 52.1	−18 15.8	147 19.3	147	− 8 06.2	+111
1	129 27.6	158 37.1	40.3	250 13.1	58.3	336 48.2	24.9	250 54.3	15.9	161 53.0	148	7 55.1	+112
2	144 30.0	173 36.6	39.2	265 13.9	58.6	351 50.8	25.0	265 56.6	15.9	176 26.8	148	7 43.9	+112
3	159 32.5	188 36.1	·· 38.1	280 14.6	·· 59.0	6 53.5	·· 25.1	280 58.8	·· 15.9	191 00.6	148	· 7 32.7	+112
4	174 34.9	203 35.7	37.0	295 15.4	59.3	21 56.2	25.2	296 01.1	16.0	205 34.4	148	7 21.5	+113
5	189 37.4	218 35.2	35.9	310 16.1	19 59.7	36 58.9	25.3	311 03.3	16.0	220 08.2	148	7 10.2	+114
6	204 39.9	233 34.7	−13 34.7	325 16.9	−20 00.1	52 01.5	+12 25.4	326 05.6	−18 16.1	234 42.0	149	− 6 58.8	+113
7	219 42.3	248 34.2	33.6	340 17.7	00.4	67 04.2	25.5	341 07.8	16.1	249 15.9	148	6 47.5	+114
8	234 44.8	263 33.8	32.5	355 18.4	00.8	82 06.9	25.5	356 10.1	16.1	263 49.7	148	6 36.1	+114
9	249 47.3	278 33.3	·· 31.4	10 19.2	·· 01.1	97 09.6	·· 25.6	11 12.3	·· 16.2	278 23.5	149	· 6 24.7	+115
10	264 49.7	293 32.8	30.3	25 20.0	01.5	112 12.2	25.7	26 14.6	16.2	292 57.4	148	6 13.2	+115
11	279 52.2	308 32.3	29.2	40 20.7	01.8	127 14.9	25.8	41 16.8	16.3	307 31.2	149	6 01.7	+115
12	294 54.7	323 31.9	−13 28.0	55 21.5	−20 02.2	142 17.6	+12 25.9	56 19.0	−18 16.3	322 05.1	148	− 5 50.2	+115
13	309 57.1	338 31.4	26.9	70 22.3	02.5	157 20.3	26.0	71 21.3	16.3	336 38.9	149	5 38.7	+116
14	324 59.6	353 30.9	25.8	85 23.0	02.9	172 22.9	26.1	86 23.5	16.4	351 12.8	149	5 27.1	+116
15	340 02.1	8 30.5	·· 24.7	100 23.8	·· 03.3	187 25.6	·· 26.2	101 25.8	·· 16.4	5 46.7	148	· 5 15.5	+116
16	355 04.5	23 30.0	23.6	115 24.5	03.6	202 28.3	26.3	116 28.0	16.5	20 20.5	149	5 03.9	+117
17	10 07.0	38 29.5	22.4	130 25.3	04.0	217 31.0	26.3	131 30.3	16.5	34 54.4	149	4 52.2	+117
18	25 09.4	53 29.0	−13 21.3	145 26.1	−20 04.3	232 33.6	+12 26.4	146 32.5	−18 16.5	49 28.3	148	− 4 40.5	+117
19	40 11.9	68 28.6	20.2	160 26.8	04.7	247 36.3	26.5	161 34.8	16.6	64 02.1	149	4 28.8	+118
20	55 14.4	83 28.1	19.1	175 27.6	05.0	262 39.0	26.6	176 37.0	16.6	78 36.0	149	4 17.0	+117
21	70 16.8	98 27.6	·· 18.0	190 28.3	·· 05.4	277 41.7	·· 26.7	191 39.3	·· 16.6	93 09.9	148	· 4 05.3	+118
22	85 19.3	113 27.2	16.8	205 29.1	05.7	292 44.4	26.8	206 41.5	16.7	107 43.7	149	3 53.5	+118
23	100 21.8	128 26.7	15.7	220 29.9	06.1	307 47.0	26.9	221 43.8	16.7	122 17.6	148	3 41.7	+118
17 0	115 24.2	143 26.2	−13 14.6	235 30.6	−20 06.4	322 49.7	+12 27.0	236 46.0	−18 16.8	136 51.4	149	− 3 29.9	+119
1	130 26.7	158 25.8	13.4	250 31.4	06.8	337 52.4	27.1	251 48.3	16.8	151 25.3	148	3 18.0	+119
2	145 29.2	173 25.3	12.3	265 32.1	07.1	352 55.1	27.1	266 50.5	16.8	165 59.1	148	3 06.1	+119
3	160 31.6	188 24.8	·· 11.2	280 32.9	·· 07.5	7 57.7	·· 27.2	281 52.8	·· 16.9	180 32.9	148	· 2 54.2	+119
4	175 34.1	203 24.4	10.1	295 33.7	07.8	23 00.4	27.3	296 55.0	16.9	195 06.7	148	2 42.3	+119
5	190 36.5	218 23.9	08.9	310 34.4	08.2	38 03.1	27.4	311 57.3	17.0	209 40.5	148	2 30.4	+120
6	205 39.0	233 23.4	−13 07.8	325 35.2	−20 08.5	53 05.8	+12 27.5	326 59.5	−18 17.0	224 14.3	148	− 2 18.4	+119
7	220 41.5	248 23.0	06.7	340 36.0	08.9	68 08.5	27.6	342 01.7	17.0	238 48.1	148	2 06.5	+120
8	235 43.9	263 22.5	05.5	355 36.7	09.2	83 11.1	27.7	357 04.0	17.1	253 21.9	148	1 54.5	+120
9	250 46.4	278 22.1	·· 04.4	10 37.5	·· 09.6	98 13.8	·· 27.8	12 06.2	·· 17.1	267 55.7	147	· 1 42.5	+121
10	265 48.9	293 21.6	03.3	25 38.2	09.9	113 16.5	27.9	27 08.5	17.1	282 29.4	148	1 30.4	+120
11	280 51.3	308 21.1	02.2	40 39.0	10.3	128 19.2	27.9	42 10.7	17.2	297 03.2	147	1 18.4	+120
12	295 53.8	323 20.7	−13 01.0	55 39.7	−20 10.6	143 21.9	+12 28.0	57 13.0	−18 17.2	311 36.9	147	− 1 06.4	+121
13	310 56.3	338 20.2	12 59.9	70 40.5	11.0	158 24.6	28.1	72 15.2	17.3	326 10.6	147	0 54.3	+121
14	325 58.7	353 19.8	58.8	85 41.3	11.3	173 27.2	28.2	87 17.5	17.3	340 44.3	147	0 42.2	+120
15	341 01.2	8 19.3	·· 57.6	100 42.0	·· 11.7	188 29.9	·· 28.3	102 19.7	·· 17.3	355 18.0	146	· 0 30.2	+121
16	356 03.7	23 18.8	56.5	115 42.8	12.0	203 32.6	28.4	117 22.0	17.4	9 51.6	147	0 18.1	+121
17	11 06.1	38 18.4	55.4	130 43.5	12.4	218 35.3	28.5	132 24.2	17.4	24 25.3	146	− 0 06.0	+121
18	26 08.6	53 17.9	−12 54.2	145 44.3	−20 12.7	233 38.0	+12 28.6	147 26.5	−18 17.5	38 58.9	146	+ 0 06.1	+122
19	41 11.0	68 17.5	53.1	160 45.1	13.1	248 40.6	28.7	162 28.7	17.5	53 32.5	145	0 18.3	+121
20	56 13.5	83 17.0	51.9	175 45.8	13.4	263 43.3	28.8	177 31.0	17.5	68 06.0	146	0 30.4	+121
21	71 16.0	98 16.6	·· 50.8	190 46.6	·· 13.8	278 46.0	·· 28.8	192 33.2	·· 17.6	82 39.6	145	· 0 42.5	+121
22	86 18.4	113 16.1	49.7	205 47.3	14.1	293 48.7	28.9	207 35.5	17.6	97 13.1	145	0 54.6	+122
23	101 20.9	128 15.7	48.5	220 48.1	14.5	308 51.4	29.0	222 37.7	17.6	111 46.6	145	1 06.8	+121
18 0	116 23.4	143 15.2	−12 47.4	235 48.9	−20 14.8	323 54.1	+12 29.1	237 40.0	−18 17.7	126 20.1	144	+ 1 18.9	+122
1	131 25.8	158 14.7	46.2	250 49.6	15.2	338 56.8	29.2	252 42.2	17.7	140 53.5	144	1 31.1	+121
2	146 28.3	173 14.3	45.1	265 50.4	15.5	353 59.4	29.3	267 44.5	17.8	155 26.9	144	1 43.2	+122
3	161 30.8	188 13.8	·· 44.0	280 51.1	·· 15.8	9 02.1	·· 29.4	282 46.7	·· 17.8	170 00.3	144	· 1 55.4	+122
4	176 33.2	203 13.4	42.8	295 51.9	16.2	24 04.8	29.5	297 49.0	17.8	184 33.7	143	2 07.6	+121
5	191 35.7	218 12.9	41.7	310 52.6	16.5	39 07.5	29.6	312 51.2	17.9	199 07.0	143	2 19.7	+122
6	206 38.1	233 12.5	−12 40.5	325 53.4	−20 16.9	54 10.2	+12 29.7	327 53.5	−18 17.9	213 40.3	143	+ 2 31.9	+121
7	221 40.6	248 12.0	39.4	340 54.2	17.2	69 12.9	29.8	342 55.7	17.9	228 13.6	142	2 44.0	+122
8	236 43.1	263 11.6	38.2	355 54.9	17.6	84 15.6	29.9	357 58.0	18.0	242 46.8	142	2 56.2	+121
9	251 45.5	278 11.1	·· 37.1	10 55.7	·· 17.9	99 18.2	·· 29.9	13 00.3	·· 18.0	257 20.0	142	· 3 08.3	+122
10	266 48.0	293 10.7	36.0	25 56.4	18.3	114 20.9	30.0	28 02.5	18.1	271 53.2	141	3 20.5	+121
11	281 50.5	308 10.3	34.8	40 57.2	18.6	129 23.6	30.1	43 04.8	18.1	286 26.3	141	3 32.6	+121
12	296 52.9	323 09.8	−12 33.7	55 57.9	−20 18.9	144 26.3	+12 30.2	58 07.0	−18 18.1	300 59.4	140	+ 3 44.7	+122
13	311 55.4	338 09.4	32.5	70 58.7	19.3	159 29.0	30.3	73 09.3	18.2	315 32.4	141	3 56.9	+121
14	326 57.9	353 08.9	31.4	85 59.4	19.6	174 31.7	30.4	88 11.5	18.2	330 05.5	139	4 09.0	+121
15	342 00.3	8 08.5	·· 30.2	101 00.2	·· 20.0	189 34.4	·· 30.5	103 13.8	·· 18.2	344 38.4	140	· 4 21.1	+121
16	357 02.8	23 08.0	29.1	116 01.0	20.3	204 37.1	30.6	118 16.0	18.3	359 11.4	138	4 33.2	+121
17	12 05.3	38 07.6	27.9	131 01.7	20.7	219 39.7	30.7	133 18.3	18.3	13 44.2	139	4 45.3	+121
18	27 07.7	53 07.1	−12 26.8	146 02.5	−20 21.0	234 42.4	+12 30.8	148 20.5	−18 18.4	28 17.1	138	+ 4 57.4	+120
19	42 10.2	68 06.7	25.6	161 03.2	21.3	249 45.1	30.9	163 22.8	18.4	42 49.9	138	5 09.4	+121
20	57 12.6	83 06.3	24.5	176 04.0	21.7	264 47.8	31.0	178 25.0	18.4	57 22.7	137	5 21.5	+120
21	72 15.1	98 05.8	·· 23.3	191 04.7	·· 22.0	279 50.5	·· 31.0	193 27.3	·· 18.5	71 55.4	136	· 5 33.5	+121
22	87 17.6	113 05.4	22.2	206 05.5	22.4	294 53.2	31.1	208 29.5	18.5	86 28.0	136	5 45.6	+120
23	102 20.0	128 04.9	21.0	221 06.2	22.7	309 55.9	31.2	223 31.8	18.5	101 00.6	136	5 57.6	+120
24	117 22.5	143 04.5	−12 19.9	236 07.0	−20 23.0	324 58.6	+12 31.3	238 34.0	−18 18.6	115 33.2	135	+ 6 09.6	+120
code	–	− 5	+ 11	+ 8	− 4	+ 27	+ 1	+ 22	− 1				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
16 0	177 39.1	−21 10.0
1	192 38.9	09.5
2	207 38.6	09.0
3	222 38.4	08.6
4	237 38.2	08.1
5	252 38.0	07.7
6	267 37.8	−21 07.2
7	282 37.5	06.8
8	297 37.3	06.3
9	312 37.1	05.8
10	327 36.9	05.4
11	342 36.7	04.9
12	357 36.4	−21 04.4
13	12 36.2	04.0
14	27 36.0	03.5
15	42 35.8	03.0
16	57 35.6	02.6
17	72 35.3	02.1
18	87 35.1	−21 01.6
19	102 34.9	01.2
20	117 34.7	00.7
21	132 34.5	−21 00.2
22	147 34.3	20 59.8
23	162 34.0	59.3
17 0	177 33.8	−20 58.8
1	192 33.6	58.3
2	207 33.4	57.9
3	222 33.2	57.4
4	237 33.0	56.9
5	252 32.8	56.4
6	267 32.5	−20 56.0
7	282 32.3	55.5
8	297 32.1	55.0
9	312 31.9	54.5
10	327 31.7	54.0
11	342 31.5	53.6
12	357 31.3	−20 53.1
13	12 31.0	52.6
14	27 30.8	52.1
15	42 30.6	51.6
16	57 30.4	51.1
17	72 30.2	50.7
18	87 30.0	−20 50.2
19	102 29.8	49.7
20	117 29.6	49.2
21	132 29.4	48.7
22	147 29.2	48.2
23	162 28.9	47.7
18 0	177 28.7	−20 47.3
1	192 28.5	46.8
2	207 28.3	46.3
3	222 28.1	45.8
4	237 27.9	45.3
5	252 27.7	44.8
6	267 27.5	−20 44.3
7	282 27.3	43.8
8	297 27.1	43.3
9	312 26.9	42.8
10	327 26.7	42.3
11	342 26.5	41.8
12	357 26.3	−20 41.3
13	12 26.1	40.8
14	27 25.9	40.3
15	42 25.6	39.8
16	57 25.4	39.3
17	72 25.2	38.8
18	87 25.0	−20 38.3
19	102 24.8	37.8
20	117 24.6	37.3
21	132 24.4	36.8
22	147 24.2	36.3
23	162 24.0	35.8
24	177 23.8	−20 35.3
code	—	+ 5

No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 50.8	−40 29.0
5	Achernar	335 58.7	−57 27.8
30	Acrux	173 57.3	−62 51.2
19	Adhara	255 46.0	−28 54.8
10	Aldebaran	291 38.5	+16 25.4
32	Alioth	166 58.2	+56 11.5
34	Alkaid	153 32.7	+49 31.5
	Al Na'ir	28 38.0	−47 10.5
15	Alnilam	276 29.7	− 1 13.8
25	Alphard	218 38.0	− 8 28.2
41	Alphecca	126 47.6	+26 51.5
1	Alpheratz	358 28.2	+28 51.1
51	Altair	62 50.5	+ 8 45.1
2	Ankaa	353 58.2	−42 32.8
42	Antares	113 19.3	−26 20.1
37	Arcturus	146 35.0	+19 24.4
43	Atria	109 00.2	−68 56.8
22	Avior	234 35.0	−59 22.1
13	Bellatrix	279 17.9	+ 6 18.6
16	Betelg'se	271 47.5	+ 7 24.0
17	Canopus	264 14.7	−52 40.4
12	Capella	281 37.6	+45 57.4
53	Deneb	50 01.3	+45 07.5
28	Denebola	183 17.3	+14 48.8
4	Diphda	349 39.1	−18 13.7
27	Dubhe	194 43.8	+61 58.9
14	Elnath	279 06.7	+28 34.3
47	Eltanin	91 06.6	+51 29.5
54	Enif	34 29.6	+ 9 40.5
56	Fomalhaut	16 11.6	−29 51.4
31	Gacrux	172 48.7	−56 51.9
29	Gienah	176 36.5	−17 18.0
35	Hadar	149 49.1	−60 09.5
6	Hamal	328 49.3	+23 15.5
48	Kaus Aust.	84 41.2	−34 24.4
40	Kochab	137 18.4	+74 19.7
57	Markab	14 21.4	+14 58.2
8	Menkar	314 59.9	+ 3 55.1
36	Menkent	148 58.4	−36 09.2
24	Miapl'dus	221 48.1	−69 32.2
9	Mirfak	309 41.8	+49 42.6
50	Nunki	76 51.9	−26 21.1
52	Peacock	54 27.5	−56 52.6
21	Pollux	244 19.9	+28 07.9
20	Procyon	245 44.4	+ 5 20.2
46	R'alhague	96 46.7	+12 35.4
26	Regulus	208 29.0	+12 10.7
11	Rigel	281 53.1	− 8 15.2
38	Rigil Kent.	140 50.7	−60 39.2
44	Sabik	103 02.2	−15 40.3
3	Schedar	350 29.8	+56 18.1
45	Shaula	97 20.7	−37 04.3
18	Sirius	259 11.3	−16 39.4
33	Spica	159 16.6	−10 56.0
23	Suhail	223 23.7	−43 15.3
49	Vega	81 08.5	+38 44.5
39	Zub'g'bi	137 53.2	−15 51.6

Lat.	Sunrise	Twlt. begins	Moonrise 16	17	18	19
°	h m	h m	h m	h m	h m	h m
N 72	▬	6 34	9 48	9 30	9 13	8 54
70	▬	6 29	9 39	9 28	9 17	9 06
68	10 28	6 26	9 32	9 26	9 21	9 15
66	9 50	6 22	9 26	9 25	9 24	9 23
64	9 23	6 17	9 21	9 23	9 26	9 29
62	9 03	6 14	9 16	9 22	9 28	9 35
60	8 46	6 11	9 12	9 21	9 30	9 40
58	8 32	6 07	9 09	9 20	9 32	9 44
56	8 20	6 04	9 06	9 19	9 33	9 48
54	8 10	6 02	9 03	9 19	9 35	9 52
52	8 00	5 59	9 00	9 18	9 36	9 55
50	7 52	5 57	8 58	9 17	9 37	9 58
45	7 34	5 51	8 53	9 16	9 39	10 04
40	7 20	5 44	8 48	9 15	9 41	10 09
35	7 07	5 39	8 45	9 14	9 43	10 14
30	6 57	5 33	8 41	9 13	9 45	10 18
20	6 38	5 21	8 36	9 12	9 48	10 26
10	6 22	5 07	8 31	9 10	9 50	10 32
0	6 06	4 52	8 26	9 09	9 53	10 38
10	5 51	4 34	8 21	9 08	9 55	10 44
20	5 34	4 11	8 16	9 07	9 58	10 51
30	5 14	3 41	8 10	9 05	10 01	10 58
35	5 03	3 20	8 07	9 04	10 03	11 02
40	4 50	2 53	8 03	9 03	10 05	11 07
45	4 34	2 15	7 59	9 02	10 07	11 13
50	4 15	1 04	7 53	9 01	10 10	11 20
52	4 06	////	7 51	9 00	10 11	11 23
54	3 55	////	7 48	9 00	10 12	11 27
56	3 44	////	7 45	8 59	10 14	11 31
58	3 30	////	7 42	8 58	10 16	11 35
60	3 14	////	7 38	8 57	10 18	11 40

Lat.	Sunset	Twlt. ends	Moonset 16	17	18	19
°	h m	h m	h m	h m	h m	h m
N 72	▬	17 46	19 50	21 39	23 32	25 33
70	▬	17 50	19 57	21 38	23 23	25 13
68	13 53	17 57	20 02	21 38	23 16	24 58
66	14 31	18 01	20 06	21 37	23 10	24 46
64	14 57	18 04	20 10	21 36	23 05	24 36
62	15 18	18 08	20 13	21 36	23 00	24 28
60	15 34	18 10	20 16	21 35	22 56	24 20
58	15 48	18 13	20 18	21 35	22 53	24 14
56	16 00	18 16	20 20	21 34	22 50	24 08
54	16 11	18 19	20 22	21 34	22 48	24 03
52	16 20	18 22	20 24	21 34	22 45	23 59
50	16 28	18 24	20 26	21 34	22 43	23 55
45	16 46	18 30	20 29	21 33	22 38	23 46
40	17 00	18 35	20 32	21 33	22 34	23 38
35	17 13	18 42	20 34	21 32	22 31	23 32
30	17 23	18 47	20 37	21 32	22 28	23 26
20	17 42	18 59	20 40	21 31	22 23	23 17
10	17 58	19 12	20 44	21 30	22 18	23 08
0	18 14	19 28	20 47	21 30	22 14	23 00
10	18 29	19 45	20 50	21 29	22 10	22 53
20	18 45	20 07	20 53	21 29	22 05	22 44
30	19 05	20 38	20 56	21 28	22 00	22 35
35	19 16	20 58	20 58	21 27	21 57	22 29
40	19 29	21 24	21 01	21 27	21 54	22 23
45	19 45	22 02	21 03	21 26	21 50	22 16
50	20 04	23 11	21 06	21 26	21 46	22 07
52	20 13	////	21 08	21 25	21 43	22 03
54	20 23	////	21 09	21 25	21 41	21 59
56	20 35	////	21 11	21 25	21 39	21 54
58	20 48	////	21 13	21 24	21 36	21 49
60	21 04	////	21 15	21 24	21 33	21 43

GMT	Equation of Time (App.—Mean) 16	17	18
h	m s	m s	m s
0	− 9 23.2	− 9 44.3	−10 04.6
6	− 9 28.5	− 9 49.4	−10 09.6
12	− 9 33.8	− 9 54.5	−10 14.6
18	− 9 39.1	− 9 59.6	−10 19.4
24	− 9 44.3	−10 04.6	−10 24.3

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
16	14 36	14 26	8 19	2 33	8 15
17	15 19	14 27	8 18	2 28	8 12
18	16 03	14 27	8 16	2 24	8 08
19	16 49	14 28	8 15	2 20	8 05

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.6	0.1	0.1
30	0.6	0.1	0.1
45	0.6	0.1	0.0
60	0.6	0.0	0.0
75	0.6	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	16	17	18
°	′	′	′
0	13.1	13.6	14.4
4	13.1	13.7	14.4
8	13.2	13.7	14.4
12	13.2	13.7	14.4
16	13.2	13.7	14.4
20	13.3	13.8	14.5
24	13.3	13.8	14.5
28	13.4	13.8	14.5
32	13.5	13.9	14.6
36	13.5	14.0	14.6
40	13.6	14.0	14.6
44	13.7	14.1	14.7
48	13.8	14.2	14.7
52	13.9	14.3	14.8
56	14.0	14.3	14.8
60	14.1	14.4	14.9
64	14.3	14.5	14.9
68	14.4	14.6	15.0
72	14.5	14.7	15.1
76	14.6	14.8	15.1
80	14.8	14.9	15.2
84	14.9	15.0	15.2
88	15.0	15.1	15.3
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	16	17	18
°	′	′	′
0	16.9	16.6	16.2
4	16.9	16.6	16.2
8	16.9	16.6	16.2
12	16.9	16.6	16.2
16	16.8	16.6	16.2
20	16.8	16.5	16.1
24	16.7	16.5	16.1
28	16.7	16.4	16.1
32	16.6	16.4	16.1
36	16.5	16.3	16.0
40	16.4	16.3	16.0
44	16.4	16.2	15.9
48	16.3	16.1	15.9
52	16.2	16.0	15.8
56	16.0	15.9	15.8
60	15.9	15.8	15.7
64	15.8	15.8	15.7
68	15.7	15.7	15.6
72	15.6	15.6	15.6
76	15.4	15.5	15.5
80	15.3	15.4	15.4
84	15.2	15.2	15.4
88	15.1	15.2	15.3
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.4 GHA	VENUS −3.4 Dec	MARS 1.6 GHA	MARS 1.6 Dec.	JUPITER −2.0 GHA	JUPITER −2.0 Dec.	SATURN 0.8 GHA	SATURN 0.8 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
19 00	117 22.5	143 04.5	−12 19.9	236 07.0	−20 23.0	324 58.6	+12 31.3	238 34.0	−18 18.6	115 33.2	135	+ 6 09.6	+120
01	132 25.0	158 04.0	18.7	251 07.8	23.4	340 01.3	31.4	253 36.3	18.6	130 05.7	135	6 21.6	+119
02	147 27.4	173 03.6	17.6	266 08.5	23.7	355 04.0	31.5	268 38.5	18.6	144 38.2	134	6 33.5	+120
03	162 29.9	188 03.2	·· 16.4	281 09.3	·· 24.1	10 06.6	·· 31.6	283 40.8	·· 18.7	159 10.6	134	· 6 45.5	+119
04	177 32.4	203 02.7	15.2	296 10.0	24.4	25 09.3	31.7	298 43.1	18.7	173 43.0	133	6 57.4	+119
05	192 34.8	218 02.3	14.1	311 10.8	24.7	40 12.0	31.8	313 45.3	18.8	188 15.3	132	7 09.3	+119
06	207 37.3	233 01.9	−12 12.9	326 11.5	−20 25.1	55 14.7	+12 31.9	328 47.6	−18 18.8	202 47.5	133	+ 7 21.2	+119
07	222 39.8	248 01.4	11.8	341 12.3	25.4	70 17.4	32.0	343 49.8	18.8	217 19.8	131	7 33.1	+118
08	237 42.2	263 01.0	10.6	356 13.0	25.7	85 20.1	32.1	358 52.1	18.9	231 51.9	131	7 44.9	+118
09	252 44.7	278 00.5	·· 09.5	11 13.8	·· 26.1	100 22.8	·· 32.2	13 54.3	·· 18.9	246 24.0	130	· 7 56.7	+118
10	267 47.1	293 00.1	08.3	26 14.5	26.4	115 25.5	32.3	28 56.6	18.9	260 56.0	130	8 08.5	+117
11	282 49.6	307 59.7	07.1	41 15.3	26.8	130 28.2	32.4	43 58.8	19.0	275 28.0	129	8 20.2	+118
12	297 52.1	322 59.2	−12 06.0	56 16.0	−20 27.1	145 30.9	+12 32.4	59 01.1	−18 19.0	289 59.9	128	+ 8 32.0	+117
13	312 54.5	337 58.8	04.8	71 16.8	27.4	160 33.6	32.5	74 03.4	19.1	304 31.7	128	8 43.7	+117
14	327 57.0	352 58.4	03.7	86 17.5	27.8	175 36.3	32.6	89 05.6	19.1	319 03.5	127	8 55.4	+116
15	342 59.5	7 57.9	·· 02.5	101 18.3	·· 28.1	190 39.0	·· 32.7	104 07.9	·· 19.1	333 35.2	127	· 9 07.0	+116
16	358 01.9	22 57.5	01.3	116 19.1	28.4	205 41.7	32.8	119 10.1	19.2	348 06.9	126	9 18.6	+116
17	13 04.4	37 57.1	12 00.2	131 19.8	28.8	220 44.3	32.9	134 12.4	19.2	2 38.5	125	9 30.2	+115
18	28 06.9	52 56.7	−11 59.0	146 20.6	−20 29.1	235 47.0	+12 33.0	149 14.6	−18 19.2	17 10.0	125	+ 9 41.7	+116
19	43 09.3	67 56.2	57.9	161 21.3	29.4	250 49.7	33.1	164 16.9	19.3	31 41.5	124	9 53.3	+114
20	58 11.8	82 55.8	56.7	176 22.1	29.8	265 52.4	33.2	179 19.1	19.3	46 12.9	123	10 04.7	+115
21	73 14.3	97 55.4	·· 55.5	191 22.8	·· 30.1	280 55.1	·· 33.3	194 21.4	·· 19.3	60 44.2	122	· 10 16.2	+114
22	88 16.7	112 54.9	54.4	206 23.6	30.4	295 57.8	33.4	209 23.7	19.4	75 15.4	122	10 27.6	+113
23	103 19.2	127 54.5	53.2	221 24.3	30.8	311 00.5	33.5	224 25.9	19.4	89 46.6	121	10 38.9	+114
20 00	118 21.6	142 54.1	−11 52.0	236 25.1	−20 31.1	326 03.2	+12 33.6	239 28.2	−18 19.4	104 17.7	121	+10 50.3	+112
01	133 24.1	157 53.7	50.9	251 25.8	31.4	341 05.9	33.7	254 30.4	19.5	118 48.8	119	11 01.5	+113
02	148 26.6	172 53.2	49.7	266 26.6	31.8	356 08.6	33.8	269 32.7	19.5	133 19.7	119	11 12.8	+112
03	163 29.0	187 52.8	·· 48.5	281 27.3	·· 32.1	11 11.3	·· 33.9	284 34.9	·· 19.6	147 50.6	118	· 11 24.0	+111
04	178 31.5	202 52.4	47.4	296 28.1	32.4	26 14.0	34.0	299 37.2	19.6	162 21.4	118	11 35.1	+111
05	193 34.0	217 52.0	46.2	311 28.8	32.8	41 16.7	34.1	314 39.4	19.6	176 52.2	117	11 46.2	+111
06	208 36.4	232 51.5	−11 45.0	326 29.6	−20 33.1	56 19.4	+12 34.1	329 41.7	−18 19.7	191 22.9	115	+11 57.3	+110
07	223 38.9	247 51.1	43.9	341 30.3	33.4	71 22.1	34.2	344 44.0	19.7	205 53.4	115	12 08.3	+109
08	238 41.4	262 50.7	42.7	356 31.1	· 33.8	86 24.8	34.3	359 46.2	19.7	220 23.9	115	12 19.2	+110
09	253 43.8	277 50.3	·· 41.5	11 31.8	·· 34.1	101 27.5	·· 34.4	14 48.5	·· 19.8	234 54.4	113	· 12 30.2	+108
10	268 46.3	292 49.8	40.4	26 32.6	34.4	116 30.2	34.5	29 50.7	19.8	249 24.7	113	12 41.0	+108
11	283 48.8	307 49.4	39.2	41 33.3	34.7	131 32.9	34.6	44 53.0	19.8	263 55.0	112	12 51.8	+108
12	298 51.2	322 49.0	−11 38.0	56 34.1	−20 35.1	146 35.6	+12 34.7	59 55.3	−18 19.9	278 25.2	111	+13 02.6	+107
13	313 53.7	337 48.6	36.8	71 34.8	35.4	161 38.3	34.8	74 57.5	19.9	292 55.3	110	13 13.3	+106
14	328 56.1	352 48.2	35.7	86 35.6	35.7	176 41.0	34.9	89 59.8	20.0	307 25.3	109	13 23.9	+106
15	343 58.6	7 47.7	·· 34.5	101 36.3	·· 36.1	191 43.7	·· 35.0	105 02.0	·· 20.0	321 55.2	109	· 13 34.5	+105
16	359 01.1	22 47.3	33.3	116 37.1	36.4	206 46.4	35.1	120 04.3	20.0	336 25.1	108	13 45.0	+105
17	14 03.5	37 46.9	32.1	131 37.8	36.7	221 49.1	35.2	135 06.5	20.1	350 54.9	106	13 55.5	+104
18	29 06.0	52 46.5	−11 31.0	146 38.6	−20 37.0	236 51.8	+12 35.3	150 08.8	−18 20.1	5 24.5	106	+14 05.9	+103
19	44 08.5	67 46.1	29.8	161 39.3	37.4	251 54.5	35.4	165 11.1	20.1	19 54.1	105	14 16.2	+103
20	59 10.9	82 45.6	28.6	176 40.1	37.7	266 57.2	35.5	180 13.3	20.2	34 23.6	104	14 26.5	+102
21	74 13.4	97 45.2	·· 27.4	191 40.8	·· 38.0	281 59.9	·· 35.6	195 15.6	·· 20.2	48 53.0	104	· 14 36.7	+102
22	89 15.9	112 44.8	26.3	206 41.6	38.4	297 02.6	35.7	210 17.8	20.2	63 22.4	102	14 46.9	+101
23	104 18.3	127 44.4	25.1	221 42.3	38.7	312 05.3	35.8	225 20.1	20.3	77 51.6	102	14 57.0	+100
21 00	119 20.8	142 44.0	−11 23.9	236 43.1	−20 39.0	327 08.0	+12 35.9	240 22.4	−18 20.3	92 20.8	100	+15 07.0	+ 99
01	134 23.2	157 43.6	22.7	251 43.8	39.3	342 10.7	36.0	255 24.6	20.3	106 49.8	100	15 16.9	+ 99
02	149 25.7	172 43.1	21.5	266 44.6	39.7	357 13.4	36.1	270 26.9	20.4	121 18.8	99	15 26.8	+ 98
03	164 28.2	187 42.7	·· 20.4	281 45.3	·· 40.0	12 16.1	·· 36.2	285 29.1	·· 20.4	135 47.7	97	· 15 36.6	+ 97
04	179 30.6	202 42.3	19.2	296 46.1	40.3	27 18.8	36.3	300 31.4	20.4	150 16.4	97	15 46.3	+ 97
05	194 33.1	217 41.9	18.0	311 46.8	40.6	42 21.5	36.4	315 33.7	20.5	164 45.1	96	15 56.0	+ 95
06	209 35.6	232 41.5	−11 16.8	326 47.6	−20 41.0	57 24.2	+12 36.5	330 35.9	−18 20.5	179 13.7	95	+16 05.5	+ 95
07	224 38.0	247 41.1	15.6	341 48.3	41.3	72 26.9	36.6	345 38.2	20.6	193 42.2	94	16 15.0	+ 94
08	239 40.5	262 40.7	14.5	356 49.0	41.6	87 29.6	36.6	0 40.4	20.6	208 10.6	93	16 24.4	+ 94
09	254 43.0	277 40.3	·· 13.3	11 49.8	·· 41.9	102 32.3	·· 36.7	15 42.7	·· 20.6	222 38.9	93	· 16 33.8	+ 92
10	269 45.4	292 39.9	12.1	26 50.5	42.3	117 35.0	36.8	30 45.0	20.7	237 07.2	91	16 43.0	+ 92
11	284 47.9	307 39.4	10.9	41 51.3	42.6	132 37.7	36.9	45 47.2	20.7	251 35.3	90	16 52.2	+ 91
12	299 50.4	322 39.0	−11 09.7	56 52.0	−20 42.9	147 40.4	+12 37.0	60 49.5	−18 20.7	266 03.3	89	+17 01.3	+ 90
13	314 52.8	337 38.6	08.5	71 52.8	43.2	162 43.1	37.1	75 51.7	20.8	280 31.2	89	17 10.3	+ 89
14	329 55.3	352 38.2	07.4	86 53.5	43.6	177 45.8	37.2	90 54.0	20.8	294 59.1	87	17 19.2	+ 88
15	344 57.7	7 37.8	·· 06.2	101 54.3	·· 43.9	192 48.5	·· 37.3	105 56.3	·· 20.8	309 26.8	86	· 17 28.0	+ 87
16	0 00.2	22 37.4	05.0	116 55.0	44.2	207 51.3	37.4	120 58.5	20.9	323 54.4	86	17 36.7	+ 87
17	15 02.7	37 37.0	03.8	131 55.8	44.5	222 54.0	37.5	136 00.8	20.9	338 22.0	84	17 45.4	+ 85
18	30 05.1	52 36.6	−11 02.6	146 56.5	−20 44.8	237 56.7	+12 37.6	151 03.1	−18 20.9	352 49.4	84	+17 53.9	+ 85
19	45 07.6	67 36.2	01.4	161 57.3	45.2	252 59.4	37.7	166 05.3	21.0	7 16.8	82	18 02.4	+ 83
20	60 10.1	82 35.8	11 00.2	176 58.0	45.5	268 02.1	37.8	181 07.6	21.0	21 44.0	82	18 10.7	+ 83
21	75 12.5	97 35.4	· 10 59.1	191 58.8	·· 45.8	283 04.8	·· 37.9	196 09.8	·· 21.0	36 11.2	80	· 18 19.0	+ 82
22	90 15.0	112 35.0	57.9	206 59.5	46.1	298 07.5	38.0	211 12.1	21.1	50 38.2	80	18 27.2	+ 80
23	105 17.5	127 34.6	56.7	222 00.2	46.4	313 10.2	38.1	226 14.4	21.1	65 05.2	78	18 35.2	+ 80
24	120 19.9	142 34.2	−10 55.5	237 01.0	−20 46.8	328 12.9	+12 38.2	241 16.6	−18 21.1	79 32.0	78	+18 43.2	+ 78
code	—	− 4	+ 12	+ 7	− 3	+ 27	+ 1	+ 22	0				

G M T	SUN GHA	SUN Dec.
h	° ′	° ′
19 0	177 23.8	−20 35.3
1	192 23.6	34.8
2	207 23.4	34.3
3	222 23.2	33.8
4	237 23.0	33.3
5	252 22.8	32.8
6	267 22.6	−20 32.3
7	282 22.4	31.7
8	297 22.2	31.2
9	312 22.0	30.7
10	327 21.8	30.2
11	342 21.6	29.7
12	357 21.4	−20 29.2
13	12 21.2	28.7
14	27 21.0	28.2
15	42 20.9	27.6
16	57 20.7	27.1
17	72 20.5	26.6
18	87 20.3	−20 26.1
19	102 20.1	25.6
20	117 19.9	25.1
21	132 19.7	24.5
22	147 19.5	24.0
23	162 19.3	23.5
20 0	177 19.1	−20 23.0
1	192 18.9	22.4
2	207 18.7	21.9
3	222 18.5	21.4
4	237 18.3	20.9
5	252 18.1	20.3
6	267 18.0	−20 19.8
7	282 17.8	19.3
8	297 17.6	18.8
9	312 17.4	18.2
10	327 17.2	17.7
11	342 17.0	17.2
12	357 16.8	−20 16.7
13	12 16.6	16.1
14	27 16.4	15.6
15	42 16.2	15.1
16	57 16.1	14.5
17	72 15.9	14.0
18	87 15.7	−20 13.5
19	102 15.5	12.9
20	117 15.3	12.4
21	132 15.1	11.9
22	147 14.9	11.3
23	162 14.8	10.8
21 0	177 14.6	−20 10.2
1	192 14.4	09.7
2	207 14.2	09.2
3	222 14.0	08.6
4	237 13.8	08.1
5	252 13.6	07.5
6	267 13.5	−20 07.0
7	282 13.3	06.5
8	297 13.1	05.9
9	312 12.9	05.4
10	327 12.7	04.8
11	342 12.6	04.3
12	357 12.4	−20 03.7
13	12 12.2	03.2
14	27 12.0	02.7
15	42 11.8	02.1
16	57 11.6	01.6
17	72 11.5	01.0
18	87 11.3	−20 00.5
19	102 11.1	19 59.9
20	117 10.9	59.4
21	132 10.8	58.8
22	147 10.6	58.3
23	162 10.4	57.7
24	177 10.2	−19 57.2
code	—	+ 6

STARS No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 50.8	−40 29.0
5	Achernar	335 58.7	−57 27.8
30	Acrux	173 57.2	−62 51.2
19	Adhara	255 45.9	−28 54.8
10	Aldebaran	291 38.5	+16 25.4
32	Alioth	166 58.2	+56 11.5
34	Alkaid	153 32.7	+49 31.5
55	Al Na'ir	28 38.0	−47 10.5
15	Alnilam	276 29.7	− 1 13.8
25	Alphard	218 38.0	− 8 28.2
41	Alphecca	126 47.6	+26 51.5
1	Alpheratz	358 28.2	+28 51.1
51	Altair	62 50.5	+ 8 45.1
2	Ankaa	353 58.2	−42 32.8
42	Antares	113 19.3	−26 20.1
37	Arcturus	146 35.0	+19 24.4
43	Atria	109 00.1	−68 56.8
22	Avior	234 35.0	−59 22.1
13	Bellatrix	279 17.9	+ 6 18.6
16	Betelg'se	271 47.5	+ 7 23.9
17	Canopus	264 14.7	−52 40.4
12	Capella	281 37.6	+45 57.4
53	Deneb	50 01.3	+45 07.5
28	Denebola	183 17.3	+14 48.8
4	Diphda	349 39.1	−18 13.7
27	Dubhe	194 43.8	+61 58.9
14	Elnath	279 06.7	+28 34.3
47	Eltanin	91 06.6	+51 29.5
54	Enif	34 29.6	+ 9 40.4
56	Fomalhaut	16 11.6	−29 51.4
31	Gacrux	172 48.7	−56 51.9
29	Gienah	176 36.4	−17 18.0
35	Hadar	149 49.0	−60 09.5
6	Hamal	328 49.3	+23 15.5
48	Kaus Aust.	84 41.2	−34 24.4
40	Kochab	137 18.3	+74 19.7
57	Markab	14 21.4	+14 58.2
8	Menkar	314 59.9	+ 3 55.1
36	Menkent	148 58.4	−36 09.2
24	Miapl'dus	221 48.0	−69 32.2
9	Mirfak	309 41.8	+49 42.6
50	Nunki	76 51.9	−26 21.1
52	Peacock	54 27.5	−56 52.6
21	Pollux	244 19.9	+28 07.9
20	Procyon	245 44.4	+ 5 20.2
46	R'alhague	96 46.6	+12 35.4
26	Regulus	208 28.9	+12 10.7
11	Rigel	281 53.1	− 8 15.2
38	Rigil Kent.	140 50.7	−60 39.2
44	Sabik	103 02.1	−15 40.3
3	Schedar	350 29.8	+56 18.1
45	Shaula	97 20.7	−37 04.3
18	Sirius	259 11.3	−16 39.4
33	Spica	159 16.6	−10 56.1
23	Suhail	223 23.7	−43 15.3
49	Vega	81 08.5	+38 44.4
39	Zub'g'bi	137 53.1	−15 51.7

G M T	Equation of Time (App.—Mean) 19	20	21
h	m s	m s	m s
0	−10 24.3	−10 43.2	−11 01.4
6	−10 29.1	−10 47.8	−11 05.8
12	−10 33.8	−10 52.4	−11 10.2
18	−10 38.5	−10 56.9	−11 14.5
24	−10 43.2	−11 01.4	−11 18.8

Lat. N °	Sunrise h m	Twlt. begins h m	Moonrise 19 h m	20 h m	21 h m	22 h m
72	▬	6 28	8 54	8 31	7 52	▭
70	11 14	6 25	9 06	8 52	8 34	7 50
68	10 14	6 21	9 15	9 09	9 02	8 53
66	9 40	6 17	9 23	9 22	9 24	9 28
64	9 16	6 13	9 29	9 34	9 41	9 54
62	8 57	6 11	9 35	9 43	9 55	10 14
60	8 41	6 08	9 40	9 52	10 08	10 31
58	8 28	6 05	9 44	9 59	10 18	10 45
56	8 16	6 03	9 48	10 06	10 27	10 57
54	8 06	5 59	9 52	10 11	10 36	11 08
52	7 57	5 57	9 55	10 17	10 43	11 17
50	7 49	5 55	9 58	10 21	10 50	11 25
45	7 32	5 49	10 04	10 32	11 04	11 43
40	7 18	5 44	10 09	10 40	11 16	11 58
35	7 06	5 38	10 14	10 48	11 26	12 11
30	6 56	5 32	10 18	10 55	11 35	12 21
20	6 38	5 21	10 26	11 06	11 51	12 40
10	6 22	5 08	10 32	11 16	12 04	12 57
0	6 07	4 54	10 38	11 26	12 17	13 12
10	5 52	4 36	10 44	11 35	12 30	13 28
20	5 36	4 14	10 51	11 46	12 44	13 45
30	5 17	3 44	10 58	11 58	13 00	14 04
35	5 06	3 24	11 02	12 05	13 09	14 15
40	4 53	2 58	11 07	12 12	13 20	14 28
45	4 38	2 22	11 13	12 22	13 32	14 44
50	4 20	1 18	11 20	12 33	13 48	15 03
52	4 11	////	11 23	12 38	13 55	15 12
54	4 01	////	11 27	12 44	14 03	15 22
56	3 50	////	11 31	12 50	14 12	15 34
58	3 37	////	11 35	12 58	14 22	15 47
60	3 22	////	11 40	13 06	14 34	16 02

Lat. N °	Sunset h m	Twlt. ends h m	Moonset 19 h m	20 h m	21 h m	22 h m
72	▬	17 55	25 33	1 33	3 56	▭
70	13 08	17 59	25 13	1 13	3 16	5 53
68	14 08	18 03	24 58	0 58	2 49	4 51
66	14 42	18 07	24 46	0 46	2 28	4 16
64	15 07	18 11	24 36	0 36	2 12	3 51
62	15 26	18 13	24 28	0 28	1 59	3 31
60	15 41	18 15	24 20	0 20	1 47	3 15
58	15 55	18 19	24 14	0 14	1 37	3 02
56	16 06	18 21	24 08	0 08	1 29	2 50
54	16 16	18 23	24 03	0 03	1 21	2 40
52	16 25	18 26	23 59	25 14	1 14	2 31
50	16 33	18 28	23 55	25 08	1 08	2 23
45	16 50	18 33	23 46	24 55	0 55	2 06
40	17 04	18 39	23 38	24 44	0 44	1 52
35	17 16	18 44	23 32	24 35	0 35	1 40
30	17 26	18 49	23 26	24 27	0 27	1 30
20	17 44	19 01	23 17	24 13	0 13	1 13
10	18 00	19 14	23 08	24 01	0 01	0 57
0	18 15	19 28	23 00	23 50	24 43	0 43
10	18 29	19 45	22 53	23 38	24 29	0 29
20	18 46	20 07	22 44	23 27	24 13	0 13
30	19 04	20 36	22 35	23 13	23 56	24 46
35	19 15	20 56	22 29	23 05	23 46	24 34
40	19 28	21 22	22 23	22 56	23 34	24 20
45	19 43	21 57	22 16	22 46	23 21	24 04
50	20 01	22 58	22 07	22 33	23 04	23 44
52	20 10	////	22 03	22 27	22 56	23 35
54	20 20	////	21 59	22 21	22 48	23 24
56	20 31	////	21 54	22 14	22 38	23 12
58	20 44	////	21 49	22 06	22 27	22 59
60	20 59	////	21 43	21 57	22 15	22 43

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
19	16 49	14 28	8 15	2 20	8 05
20	17 38	14 29	8 14	2 15	8 01
21	18 30	14 30	8 13	2 11	7 57
22	19 26	14 30	8 12	2 07	7 54

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.6	0.1	0.1
30	0.6	0.1	0.1
45	0.6	0.1	0.0
60	0.6	0.0	0.0
75	0.6	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt. °	19 ′	20 ′	21 ′
0	15.3	16.2	17.2
4	15.3	16.2	17.2
8	15.3	16.2	17.2
12	15.3	16.2	17.2
16	15.3	16.2	17.1
20	15.3	16.2	17.1
24	15.3	16.1	17.1
28	15.3	16.1	17.0
32	15.3	16.1	17.0
36	15.3	16.1	16.9
40	15.3	16.1	16.9
44	15.4	16.0	16.8
48	15.4	16.0	16.7
52	15.4	16.0	16.7
56	15.4	16.0	16.6
60	15.4	15.9	16.5
64	15.4	15.9	16.4
68	15.4	15.9	16.4
72	15.4	15.8	16.3
76	15.5	15.8	16.2
80	15.5	15.8	16.1
84	15.5	15.7	16.0
88	15.5	15.7	15.9
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt. °	19 ′	20 ′	21 ′
0	15.7	15.2	14.6
4	15.7	15.2	14.6
8	15.7	15.2	14.6
12	15.7	15.2	14.6
16	15.7	15.2	14.7
20	15.7	15.2	14.7
24	15.7	15.2	14.7
28	15.7	15.3	14.8
32	15.7	15.3	14.8
36	15.7	15.3	14.9
40	15.6	15.3	14.9
44	15.6	15.3	15.0
48	15.6	15.4	15.1
52	15.6	15.4	15.1
56	15.6	15.4	15.2
60	15.6	15.5	15.3
64	15.6	15.5	15.4
68	15.6	15.5	15.5
72	15.6	15.5	15.5
76	15.5	15.6	15.6
80	15.5	15.6	15.7
84	15.5	15.7	15.8
88	15.5	15.7	15.9
90			

Subtract from table, back cover

First Quarter 20

GMT	♈ GHA	VENUS — 3.5 GHA	VENUS — 3.5 Dec	MARS 1.6 GHA	MARS 1.6 Dec.	JUPITER — 2.0 GHA	JUPITER — 2.0 Dec.	SATURN 0.8 GHA	SATURN 0.8 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
22 0	120 19.9	142 34.2	−10 55.5	237 01.0	−20 46.8	328 12.9	+12 38.2	241 16.6	−18 21.1	79 32.0	78	+18 43.2	+ 78
1	135 22.4	157 33.8	54.3	252 01.7	47.1	343 15.6	38.3	256 18.9	21.2	93 58.8	76	18 51.0	+ 78
2	150 24.9	172 33.4	53.1	267 02.5	47.4	358 18.3	38.4	271 21.2	21.2	108 25.4	76	18 58.8	+ 76
3	165 27.3	187 33.0	·· 51.9	282 03.2	·· 47.7	13 21.0	·· 38.5	286 23.4	·· 21.2	122 52.0	74	·19 06.4	+ 76
4	180 29.8	202 32.6	50.7	297 04.0	48.0	28 23.7	38.6	301 25.7	21.3	137 18.4	74	19 14.0	+ 74
5	195 32.2	217 32.2	49.5	312 04.7	48.4	43 26.4	38.7	316 28.0	21.3	151 44.8	73	19 21.4	+ 73
6	210 34.7	232 31.8	−10 48.3	327 05.5	−20 48.7	58 29.1	+12 38.8	331 30.2	−18 21.4	166 11.1	71	+19 28.7	+ 72
7	225 37.2	247 31.4	47.1	342 06.2	49.0	73 31.9	38.9	346 32.5	21.4	180 37.2	71	19 35.9	+ 71
8	240 39.6	262 31.0	46.0	357 06.9	49.3	88 34.6	39.0	1 34.7	21.4	195 03.3	70	19 43.0	+ 70
9	255 42.1	277 30.6	·· 44.8	12 07.7	·· 49.6	103 37.3	·· 39.1	16 37.0	·· 21.5	209 29.3	69	·19 50.0	+ 69
10	270 44.6	292 30.2	43.6	27 08.4	49.9	118 40.0	39.2	31 39.3	21.5	223 55.2	67	19 56.9	+ 67
11	285 47.0	307 29.8	42.4	42 09.2	50.3	133 42.7	39.3	46 41.5	21.5	238 20.9	67	20 03.6	+ 67
12	300 49.5	322 29.4	−10 41.2	57 09.9	−20 50.6	148 45.4	+12 39.4	61 43.8	−18 21.6	252 46.6	66	+20 10.3	+ 65
13	315 52.0	337 29.0	40.0	72 10.7	50.9	163 48.1	39.5	76 46.1	21.6	267 12.2	65	20 16.8	+ 64
14	330 54.4	352 28.6	38.8	87 11.4	51.2	178 50.8	39.6	91 48.3	21.6	281 37.7	64	20 23.2	+ 62
15	345 56.9	7 28.2	·· 37.6	102 12.2	·· 51.5	193 53.5	·· 39.7	106 50.6	·· 21.7	296 03.1	63	·20 29.4	+ 62
16	0 59.3	22 27.8	36.4	117 12.9	51.8	208 56.2	39.8	121 52.9	21.7	310 28.4	62	20 35.6	+ 60
17	16 01.8	37 27.4	35.2	132 13.6	52.2	223 59.0	39.9	136 55.1	21.7	324 53.6	62	20 41.6	+ 59
18	31 04.3	52 27.0	−10 34.0	147 14.4	−20 52.5	239 01.7	+12 40.0	151 57.4	−18 21.8	339 18.8	60	+20 47.5	+ 58
19	46 06.7	67 26.6	32.8	162 15.1	52.8	254 04.4	40.1	166 59.7	21.8	353 43.8	59	20 53.3	+ 56
20	61 09.2	82 26.2	31.6	177 15.9	53.1	269 07.1	40.2	182 01.9	21.8	8 08.7	59	20 58.9	+ 55
21	76 11.7	97 25.8	·· 30.4	192 16.6	·· 53.4	284 09.8	·· 40.3	197 04.2	·· 21.9	22 33.6	58	·21 04.4	+ 54
22	91 14.1	112 25.4	29.2	207 17.4	53.7	299 12.5	40.4	212 06.5	21.9	36 58.4	56	21 09.8	+ 52
23	106 16.6	127 25.0	28.0	222 18.1	54.0	314 15.2	40.5	227 08.7	21.9	51 23.0	56	21 15.0	+ 51
23 0	121 19.1	142 24.7	−10 26.8	237 18.8	−20 54.4	329 17.9	+12 40.6	242 11.0	−18 22.0	65 47.6	55	+21 20.1	+ 50
1	136 21.5	157 24.3	25.6	252 19.6	54.7	344 20.7	40.7	257 13.3	22.0	80 12.1	54	21 25.1	+ 48
2	151 24.0	172 23.9	24.4	267 20.3	55.0	359 23.4	40.8	272 15.5	22.0	94 36.5	53	21 29.9	+ 47
3	166 26.5	187 23.5	·· 23.2	282 21.1	·· 55.3	14 26.1	·· 40.9	287 17.8	·· 22.1	109 00.8	53	·21 34.6	+ 46
4	181 28.9	202 23.1	22.0	297 21.8	55.6	29 28.8	41.0	302 20.0	22.1	123 25.1	52	21 39.2	+ 44
5	196 31.4	217 22.7	20.8	312 22.6	55.9	44 31.5	41.1	317 22.3	22.1	137 49.3	50	21 43.6	+ 42
6	211 33.8	232 22.3	−10 19.6	327 23.3	−20 56.2	59 34.2	+12 41.2	332 24.6	−18 22.2	152 13.3	50	+21 47.8	+ 42
7	226 36.3	247 21.9	18.4	342 24.0	56.5	74 36.9	41.3	347 26.8	22.2	166 37.3	50	21 52.0	+ 39
8	241 38.8	262 21.5	17.2	357 24.8	56.9	89 39.7	41.4	2 29.1	22.2	181 01.3	48	21 55.9	+ 39
9	256 41.2	277 21.2	·· 16.0	12 25.5	·· 57.2	104 42.4	·· 41.5	17 31.4	·· 22.3	195 25.1	48	·21 59.8	+ 37
10	271 43.7	292 20.8	14.8	27 26.3	57.5	119 45.1	41.6	32 33.7	22.3	209 48.9	47	22 03.5	+ 35
11	286 46.2	307 20.4	13.6	42 27.0	57.8	134 47.8	41.7	47 35.9	22.3	224 12.6	46	22 07.0	+ 34
12	301 48.6	322 20.0	−10 12.4	57 27.7	−20 58.1	149 50.5	+12 41.8	62 38.2	−18 22.4	238 36.2	45	+22 10.4	+ 32
13	316 51.1	337 19.6	11.1	72 28.5	58.4	164 53.2	41.9	77 40.5	22.4	252 59.7	45	22 13.6	+ 31
14	331 53.6	352 19.2	09.9	87 29.2	58.7	179 55.9	42.0	92 42.7	22.4	267 23.2	44	22 16.7	+ 30
15	346 56.0	7 18.8	·· 08.7	102 30.0	·· 59.0	194 58.7	·· 42.1	107 45.0	·· 22.5	281 46.6	43	·22 19.7	+ 28
16	1 58.5	22 18.5	07.5	117 30.7	59.3	210 01.4	42.2	122 47.3	22.5	296 09.9	43	22 22.5	+ 26
17	17 01.0	37 18.1	06.3	132 31.4	59.6	225 04.1	42.3	137 49.5	22.5	310 33.2	42	22 25.1	+ 25
18	32 03.4	52 17.7	−10 05.1	147 32.2	−20 59.9	240 06.8	+12 42.4	152 51.8	−18 22.6	324 56.4	42	+22 27.6	+ 23
19	47 05.9	67 17.3	03.9	162 32.9	21 00.3	255 09.5	42.5	167 54.1	22.6	339 19.6	40	22 29.9	+ 22
20	62 08.3	82 16.9	02.7	177 33.7	00.6	270 12.2	42.6	182 56.3	22.6	353 42.6	41	22 32.1	+ 20
21	77 10.8	97 16.6	·· 01.5	192 34.4	·· 00.9	285 15.0	·· 42.7	197 58.6	·· 22.7	8 05.7	39	·22 34.1	+ 18
22	92 13.3	112 16.2	10 00.3	207 35.1	01.2	300 17.7	42.8	213 00.9	22.7	22 28.6	39	22 35.9	+ 17
23	107 15.7	127 15.8	9 59.1	222 35.9	01.5	315 20.4	42.9	228 03.1	22.7	36 51.5	39	22 37.6	+ 16
24 0	122 18.2	142 15.4	− 9 57.8	237 36.6	−21 01.8	330 23.1	+12 43.0	243 05.4	−18 22.8	51 14.4	38	+22 39.2	+ 13
1	137 20.7	157 15.0	56.6	252 37.4	02.1	345 25.8	43.1	258 07.7	22.8	65 37.2	38	22 40.5	+ 12
2	152 23.1	172 14.7	55.4	267 38.1	02.4	0 28.5	43.2	273 09.9	22.8	80 00.0	37	22 41.7	+ 11
3	167 25.6	187 14.3	·· 54.2	282 38.8	·· 02.7	15 31.3	·· 43.3	288 12.2	·· 22.9	94 22.7	36	·22 42.8	+ 9
4	182 28.1	202 13.9	53.0	297 39.6	03.0	30 34.0	43.4	303 14.5	22.9	108 45.3	36	22 43.7	+ 7
5	197 30.5	217 13.5	51.8	312 40.3	03.3	45 36.7	43.5	318 16.8	22.9	123 07.9	36	22 44.4	+ 5
6	212 33.0	232 13.2	− 9 50.6	327 41.1	−21 03.6	60 39.4	+12 43.6	333 19.0	−18 23.0	137 30.5	35	+22 44.9	+ 4
7	227 35.4	247 12.8	49.4	342 41.8	03.9	75 42.1	43.7	348 21.3	23.0	151 53.0	35	22 45.3	+ 3
8	242 37.9	262 12.4	48.1	357 42.5	04.2	90 44.9	43.8	3 23.6	23.0	166 15.5	35	22 45.6	0
9	257 40.4	277 12.0	·· 46.9	12 43.3	·· 04.5	105 47.6	·· 43.9	18 25.8	·· 23.1	180 38.0	34	·22 45.6	− 1
10	272 42.8	292 11.7	45.7	27 44.0	04.8	120 50.3	44.0	33 28.1	23.1	195 00.4	34	22 45.5	− 3
11	287 45.3	307 11.3	44.5	42 44.7	05.1	135 53.0	44.1	48 30.4	23.1	209 22.8	33	22 45.2	− 4
12	302 47.8	322 10.9	− 9 43.3	57 45.5	−21 05.4	150 55.7	+12 44.2	63 32.6	−18 23.2	223 45.1	34	+22 44.8	− 6
13	317 50.2	337 10.5	42.1	72 46.2	05.7	165 58.5	44.3	78 34.9	23.2	238 07.5	33	22 44.2	− 8
14	332 52.7	352 10.2	40.8	87 47.0	06.1	181 01.2	44.4	93 37.2	23.2	252 29.8	32	22 43.4	− 9
15	347 55.2	7 09.8	·· 39.6	102 47.7	·· 06.4	196 03.9	·· 44.5	108 39.5	·· 23.3	266 52.0	33	·22 42.5	− 11
16	2 57.6	22 09.4	38.4	117 48.4	06.7	211 06.6	44.6	123 41.7	23.3	281 14.3	32	22 41.4	− 13
17	18 00.1	37 09.1	37.2	132 49.2	07.0	226 09.3	44.7	138 44.0	23.3	295 36.5	32	22 40.1	− 15
18	33 02.6	52 08.7	− 9 36.0	147 49.9	−21 07.3	241 12.1	+12 44.8	153 46.3	−18 23.3	309 58.7	32	+22 38.6	− 16
19	48 05.0	67 08.3	34.7	162 50.6	07.6	256 14.8	45.0	168 48.5	23.4	324 20.9	32	22 37.0	− 18
20	63 07.5	82 07.9	33.5	177 51.4	07.9	271 17.5	45.1	183 50.8	23.4	338 43.1	32	22 35.2	− 19
21	78 09.9	97 07.6	·· 32.3	192 52.1	·· 08.2	286 20.2	·· 45.2	198 53.1	·· 23.4	353 05.3	32	·22 33.3	− 21
22	93 12.4	112 07.2	31.1	207 52.9	08.5	301 23.0	45.3	213 55.4	23.5	7 27.5	31	22 31.2	− 23
23	108 14.9	127 06.8	29.9	222 53.6	08.8	316 25.7	45.4	228 57.6	23.5	21 49.6	32	22 28.9	− 25
24	123 17.3	142 06.5	− 9 28.6	237 54.3	−21 09.1	331 28.4	+12 45.5	243 59.9	−18 23.5	36 11.8	31	+22 26.4	− 26
code	−	− 4	+ 13	+ 8	− 3	+ 27	+ 1	+ 23	0				

G M T	SUN GHA	SUN Dec.
h	° ′	° ′
22 0	177 10.2	−19 57.2
1	192 10.0	56.6
2	207 09.9	56.0
3	222 09.7	55.5
4	237 09.5	54.9
5	252 09.3	54.4
6	267 09.2	−19 53.8
7	282 09.0	53.3
8	297 08.8	52.7
9	312 08.6	52.1
10	327 08.5	51.6
11	342 08.3	51.0
12	357 08.1	−19 50.5
13	12 08.0	49.9
14	27 07.8	49.3
15	42 07.6	48.8
16	57 07.4	48.2
17	72 07.3	47.6
18	87 07.1	−19 47.1
19	102 06.9	46.5
20	117 06.8	46.0
21	132 06.6	45.4
22	147 06.4	44.8
23	162 06.2	44.3
23 0	177 06.1	−19 43.7
1	192 05.9	43.1
2	207 05.7	42.5
3	222 05.6	42.0
4	237 05.4	41.4
5	252 05.2	40.8
6	267 05.1	−19 40.3
7	282 04.9	39.7
8	297 04.7	39.1
9	312 04.6	38.5
10	327 04.4	38.0
11	342 04.2	37.4
12	357 04.1	−19 36.8
13	12 03.9	36.2
14	27 03.7	35.7
15	42 03.6	35.1
16	57 03.4	34.5
17	72 03.3	33.9
18	87 03.1	−19 33.3
19	102 02.9	32.8
20	117 02.8	32.2
21	132 02.6	31.6
22	147 02.4	31.0
23	162 02.3	30.4
24 0	177 02.1	−19 29.8
1	192 02.0	29.3
2	207 01.8	28.7
3	222 01.6	28.1
4	237 01.5	27.5
5	252 01.3	26.9
6	267 01.2	−19 26.3
7	282 01.0	25.7
8	297 00.8	25.2
9	312 00.7	24.6
10	327 00.5	24.0
11	342 00.4	23.4
12	357 00.2	−19 22.8
13	12 00.1	22.2
14	26 59.9	21.6
15	41 59.8	21.0
16	56 59.6	20.4
17	71 59.4	19.8
18	86 59.3	−19 19.2
19	101 59.1	18.6
20	116 59.0	18.0
21	131 58.8	17.5
22	146 58.7	16.9
23	161 58.5	16.3
24	176 58.4	−19 15.7
code	—	+ 6

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 50.8	−40 29.0
5	Achernar	335 58.7	−57 27.8
30	Acrux	173 57.2	−62 51.2
19	Adhara	255 46.0	−28 54.8
10	Aldebaran	291 38.5	+16 25.4
32	Alioth	166 58.1	+56 11.5
34	Alkaid	153 32.6	+49 31.5
55	Al Na'ir	28 38.0	−47 10.5
15	Alnilam	276 29.7	− 1 13.8
25	Alphard	218 38.0	− 8 28.2
41	Alphecca	126 47.5	+26 51.5
1	Alpheratz	358 28.2	+28 51.1
51	Altair	62 50.5	+ 8 45.1
2	Ankaa	353 58.2	−42 32.8
42	Antares	113 19.2	−26 20.1
37	Arcturus	146 34.9	+19 24.4
43	Atria	109 00.1	−68 56.8
22	Avior	234 35.0	−59 22.2
13	Bellatrix	279 17.9	+ 6 18.6
16	Betelg'se	271 47.6	+ 7 23.9
17	Canopus	264 14.7	−52 40.5
12	Capella	281 37.7	+45 57.4
53	Deneb	50 01.3	+45 07.4
28	Denebola	183 17.3	+14 48.8
4	Diphda	349 39.1	−18 13.7
27	Dubhe	194 43.8	+61 59.0
14	Elnath	279 06.7	+28 34.3
47	Eltanin	91 06.6	+51 29.5
54	Enif	34 29.6	+ 9 40.4
56	Fomalhaut	16 11.6	−29 51.4
31	Gacrux	172 48.7	−56 51.9
29	Gienah	176 36.4	−17 18.0
35	Hadar	149 49.0	−60 09.6
6	Hamal	328 49.3	+23 15.5
48	Kaus Aust.	84 41.2	−34 24.4
40	Kochab	137 18.2	+74 19.7
57	Markab	14 21.4	+14 58.2
8	Menkar	314 59.9	+ 3 55.1
36	Menkent	148 58.3	−36 09.2
24	Miaplacidus	221 48.0	−69 32.2
9	Mirfak	309 41.8	+49 42.6
50	Nunki	76 51.9	−26 21.1
52	Peacock	54 27.5	−56 52.6
21	Pollux	244 19.9	+28 07.9
20	Procyon	245 44.4	+ 5 20.2
46	Rasalhague	96 46.6	+12 35.4
26	Regulus	208 28.9	+12 10.7
11	Rigel	281 53.1	− 8 15.2
38	Rigil Kent.	140 50.6	−60 39.2
44	Sabik	103 02.1	−15 40.3
3	Schedar	350 29.9	+56 18.1
45	Shaula	97 20.6	−37 04.3
18	Sirius	259 11.3	−16 39.4
33	Spica	159 16.5	−10 56.1
23	Suhail	223 23.7	−43 15.4
49	Vega	81 08.5	+38 44.4
39	Zuben'gubi	137 53.1	−15 51.7

Lat. N °	Sunrise h m	Twlt. begins h m
72	▬	6 21
70	10 48	6 19
68	10 01	6 15
66	9 30	6 12
64	9 08	6 10
62	8 50	6 06
60	8 35	6 04
58	8 23	6 02
56	8 12	5 59
54	8 02	5 57
52	7 54	5 55
50	7 46	5 53
45	7 30	5 48
40	7 17	5 42
35	7 05	5 38
30	6 55	5 32
20	6 38	5 21
10	6 23	5 08
0	6 08	4 55
10	5 54	4 38
20	5 38	4 16
30	5 20	3 48
35	5 09	3 28
40	4 57	3 04
45	4 42	2 29
50	4 25	1 32
52	4 16	0 41
54	4 07	////
56	3 56	////
58	3 44	////
60	3 29	////

Moonrise 22 h m	23 h m	24 h m	25 h m
□	□	□	□
7 50	□	□	□
8 53	8 29	□	10 45
9 28	9 42	10 25	11 55
9 54	10 19	11 09	12 31
10 14	10 46	11 38	12 57
10 31	11 06	12 01	13 17
10 45	11 23	12 19	13 34
10 57	11 38	12 34	13 48
11 08	11 50	12 48	14 00
11 17	12 01	12 59	14 11
11 25	12 11	13 09	14 20
11 43	12 32	13 31	14 40
11 58	12 48	13 48	14 57
12 11	13 03	14 03	15 10
12 21	13 15	14 16	15 22
12 40	13 36	14 37	15 43
12 57	13 54	14 56	16 00
13 12	14 12	15 14	16 17
13 28	14 29	15 32	16 34
13 45	14 48	15 50	16 51
14 04	15 09	16 12	17 12
14 15	15 22	16 25	17 23
14 28	15 36	16 40	17 37
14 44	15 53	16 57	17 53
15 03	16 15	17 19	18 13
15 12	16 25	17 29	18 22
15 22	16 37	17 41	18 32
15 34	16 50	17 54	18 44
15 47	17 05	18 10	18 58
16 02	17 24	18 28	19 14

Lat. N °	Sunset h m	Twlt. ends h m
72	▬	18 05
70	13 37	18 09
68	14 24	18 11
66	14 54	18 14
64	15 16	18 16
62	15 34	18 19
60	15 49	18 22
58	16 01	18 23
56	16 12	18 26
54	16 22	18 28
52	16 30	18 30
50	16 38	18 32
45	16 54	18 37
40	17 07	18 41
35	17 19	18 47
30	17 29	18 52
20	17 46	19 03
10	18 01	19 14
0	18 15	19 28
10	18 30	19 45
20	18 45	20 06
30	19 03	20 34
35	19 14	20 54
40	19 26	21 18
45	19 40	21 51
50	19 58	22 47
52	20 06	23 32
54	20 15	////
56	20 26	////
58	20 38	////
60	20 52	////

Moonset 22 h m	23 h m	24 h m	25 h m
□	□	□	□
5 53	□	□	□
4 51	7 16	□	9 23
4 16	6 03	7 30	8 12
3 51	5 27	6 46	7 36
3 31	5 01	6 16	7 10
3 15	4 40	5 54	6 49
3 02	4 24	5 36	6 32
2 50	4 10	5 20	6 18
2 40	3 57	5 07	6 05
2 31	3 47	4 56	5 54
2 23	3 37	4 45	5 45
2 06	3 17	4 24	5 24
1 52	3 01	4 07	5 07
1 40	2 47	3 52	4 53
1 30	2 35	3 39	4 41
1 13	2 14	3 18	4 20
0 57	1 57	2 59	4 01
0 43	1 40	2 41	3 44
0 29	1 24	2 23	3 27
0 13	1 06	2 04	3 08
24 46	0 46	1 43	2 47
24 34	0 34	1 30	2 34
24 20	0 20	1 15	2 19
24 04	0 04	0 57	2 02
23 44	24 36	0 36	1 41
23 35	24 25	0 25	1 30
23 24	24 14	0 14	1 19
23 12	24 00	0 00	1 06
22 59	23 45	24 50	0 50
22 43	23 27	24 32	0 32

G M T	Equation of Time (App.—Mean) 22	23	24
h	m s	m s	m s
0	−11 18.8	−11 35.4	−11 51.2
6	−11 23.0	−11 39.4	−11 55.0
12	−11 27.2	−11 43.4	−11 58.8
18	−11 31.3	−11 47.3	−12 02.5
24	−11 35.4	−11 51.2	−12 06.2

GMT of Transit Meridian of Greenwich DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
22	19 26	14 30	8 12	2 07	7 54
23	20 26	14 31	8 10	2 02	7 50
24	21 29	14 31	8 09	1 58	7 47
25	22 32	14 32	8 08	1 54	7 43

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb **Add** ′	Venus **Add** ′	Mars **Add** ′
0	0.6	0.1	0.1
30	0.6	0.1	0.1
45	0.6	0.1	0.0
60	0.6	0.0	0.0
75	0.6	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt. °	22 ′	23 ′	24 ′
0	18.2	19.2	20.0
4	18.2	19.2	20.0
8	18.2	19.2	20.0
12	18.2	19.2	19.9
16	18.1	19.1	19.8
20	18.1	19.0	19.8
24	18.0	18.9	19.6
28	17.9	18.9	19.5
32	17.9	18.7	19.4
36	17.8	18.6	19.3
40	17.7	18.5	19.1
44	17.6	18.4	18.9
48	17.5	18.2	18.8
52	17.4	18.0	18.6
56	17.2	17.9	18.4
60	17.1	17.7	18.1
64	17.0	17.5	17.9
68	16.8	17.3	17.7
72	16.7	17.1	17.5
76	16.6	16.9	17.2
80	16.4	16.7	17.0
84	16.3	16.5	16.7
88	16.2	16.4	16.6
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt. °	22 ′	23 ′	24 ′
0	14.0	13.4	13.0
4	14.0	13.5	13.0
8	14.1	13.5	13.1
12	14.1	13.5	13.1
16	14.1	13.6	13.2
20	14.2	13.7	13.3
24	14.2	13.7	13.4
28	14.3	13.8	13.5
32	14.4	13.9	13.6
36	14.5	14.1	13.7
40	14.6	14.2	13.9
44	14.7	14.3	14.1
48	14.8	14.5	14.3
52	14.9	14.6	14.4
56	15.0	14.8	14.6
60	15.1	15.0	14.9
64	15.3	15.2	15.1
68	15.4	15.3	15.3
72	15.5	15.5	15.5
76	15.7	15.7	15.8
80	15.8	15.9	16.0
84	16.0	16.1	16.3
88	16.1	16.3	16.4
90			

Subtract from table, back cover

G M T	♈ GHA	VENUS −3.5 GHA	Dec.	MARS 1.5 GHA	Dec	JUPITER −2.0 GHA	Dec.	SATURN 0.8 GHA	Dec	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
25 0	123 17.3	142 06.5	− 9 28.6	237 54.3	−21 09.1	331 28.4	+12 45.5	243 59.9	−18 23.5	36 11.8	31	+22 26.4	− 26
1	138 19.8	157 06.1	27.4	252 55.1	09.4	346 31.1	45.6	259 02.2	23.6	50 33.9	32	22 23.8	− 28
2	153 22.3	172 05.7	26.2	267 55.8	09.7	1 33.8	45.7	274 04.5	23.6	64 56.1	31	22 21.0	− 29
3	168 24.7	187 05.4	·· 25.0	282 56.5	·· 10.0	16 36.6	·· 45.8	289 06.7	·· 23.6	79 18.2	32	·22 18.1	− 32
4	183 27.2	202 05.0	23.8	297 57.3	10.3	31 39.3	45.9	304 09.0	23.7	93 40.4	32	22 14.9	− 33
5	198 29.7	217 04.6	22.5	312 58.0	10.6	46 42.0	46.0	319 11.3	23.7	108 02.6	31	22 11.6	− 34
6	213 32.1	232 04.3	− 9 21.3	327 58.7	−21 10.9	61 44.7	+12 46.1	334 13.5	−18 23.7	122 24.7	32	+22 08.2	− 37
7	228 34.6	247 03.9	20.1	342 59.5	11.2	76 47.5	46.2	349 15.8	23.8	136 46.9	32	22 04.5	− 37
8	243 37.1	262 03.5	18.9	358 00.2	11.4	91 50.2	46.3	4 18.1	23.8	151 09.1	32	22 00.8	− 40
9	258 39.5	277 03.2	·· 17.6	13 00.9	·· 11.7	106 52.9	·· 46.4	19 20.4	·· 23.8	165 31.3	32	·21 56.8	− 41
10	273 42.0	292 02.8	16.4	28 01.7	12.0	121 55.6	46.5	34 22.6	23.9	179 53.5	33	21 52.7	− 43
11	288 44.4	307 02.4	15.2	43 02.4	12.3	136 58.4	46.6	49 24.9	23.9	194 15.8	32	21 48.4	− 45
12	303 46.9	322 02.1	− 9 14.0	58 03.2	−21 12.6	152 01.1	+12 46.7	64 27.2	−18 23.9	208 38.0	33	+21 43.9	− 46
13	318 49.4	337 01.7	12.7	73 03.9	12.9	167 03.8	46.8	79 29.5	24.0	223 00.3	33	21 39.3	− 48
14	333 51.8	352 01.4	11.5	88 04.6	13.2	182 06.5	46.9	94 31.7	24.0	237 22.6	34	21 34.5	− 49
15	348 54.3	7 01.0	·· 10.3	103 05.4	·· 13.5	197 09.3	·· 47.0	109 34.0	·· 24.0	251 45.0	33	·21 29.6	− 51
16	3 56.8	22 00.6	09.0	118 06.1	13.8	212 12.0	47.1	124 36.3	24.0	266 07.3	34	21 24.5	− 53
17	18 59.2	37 00.3	07.8	133 06.8	14.1	227 14.7	47.2	139 38.6	24.1	280 29.7	35	21 19.2	− 54
18	34 01.7	51 59.9	− 9 06.6	148 07.6	−21 14.4	242 17.4	+12 47.3	154 40.8	−18 24.1	294 52.2	34	+21 13.8	− 56
19	49 04.2	66 59.6	05.4	163 08.3	14.7	257 20.2	47.4	169 43.1	24.1	309 14.6	35	21 08.2	− 57
20	64 06.6	81 59.2	04.1	178 09.0	15.0	272 22.9	47.5	184 45.4	24.2	323 37.1	36	21 02.5	− 59
21	79 09.1	96 58.8	·· 02.9	193 09.8	·· 15.3	287 25.6	·· 47.6	199 47.7	·· 24.2	337 59.7	35	·20 56.6	− 61
22	94 11.6	111 58.5	01.7	208 10.5	15.6	302 28.3	47.8	214 49.9	24.2	352 22.2	37	20 50.5	− 62
23	109 14.0	126 58.1	9 00.4	223 11.2	15.9	317 31.1	47.9	229 52.2	24.3	6 44.9	36	20 44.3	− 64
26 0	124 16.5	141 57.8	− 8 59.2	238 12.0	−21 16.2	332 33.8	+12 48.0	244 54.5	−18 24.3	21 07.5	37	+20 37.9	− 65
1	139 18.9	156 57.4	58.0	253 12.7	16.5	347 36.5	48.1	259 56.8	24.3	35 30.2	38	20 31.4	− 67
2	154 21.4	171 57.1	56.7	268 13.4	16.8	2 39.3	48.2	274 59.0	24.4	49 53.0	38	20 24.7	− 68
3	169 23.9	186 56.7	·· 55.5	283 14.2	·· 17.0	17 42.0	·· 48.3	290 01.3	·· 24.4	64 15.8	38	·20 17.9	− 69
4	184 26.3	201 56.4	54.3	298 14.9	17.3	32 44.7	48.4	305 03.6	24.4	78 38.6	39	20 11.0	− 72
5	199 28.8	216 56.0	53.1	313 15.6	17.6	47 47.4	48.5	320 05.9	24.5	93 01.5	40	20 03.8	− 72
6	214 31.3	231 55.6	− 8 51.8	328 16.4	−21 17.9	62 50.2	+12 48.6	335 08.1	−18 24.5	107 24.5	40	+19 56.6	− 74
7	229 33.7	246 55.3	50.6	343 17.1	18.2	77 52.9	48.7	350 10.4	24.5	121 47.5	41	19 49.2	− 76
8	244 36.2	261 54.9	49.4	358 17.8	18.5	92 55.6	48.8	5 12.7	24.5	136 10.6	41	19 41.6	− 77
9	259 38.7	276 54.6	·· 48.1	13 18.6	·· 18.8	107 58.4	·· 48.9	20 15.0	·· 24.6	150 33.7	42	·19 33.9	− 79
10	274 41.1	291 54.2	46.9	28 19.3	19.1	123 01.1	49.0	35 17.3	24.6	164 56.9	42	19 26.0	− 79
11	289 43.6	306 53.9	45.6	43 20.0	19.4	138 03.8	49.1	50 19.5	24.6	179 20.1	43	19 18.1	− 82
12	304 46.0	321 53.5	− 8 44.4	58 20.8	−21 19.7	153 06.5	+12 49.2	65 21.8	−18 24.7	193 43.4	44	+19 09.9	− 82
13	319 48.5	336 53.2	43.2	73 21.5	20.0	168 09.3	49.3	80 24.1	24.7	208 06.8	44	19 01.7	− 84
14	334 51.0	351 52.8	41.9	88 22.2	20.2	183 12.0	49.4	95 26.4	24.7	222 30.2	45	18 53.3	− 86
15	349 53.4	6 52.5	·· 40.7	103 22.9	·· 20.5	198 14.7	·· 49.5	110 28.6	·· 24.8	236 53.7	46	·18 44.7	− 86
16	4 55.9	21 52.1	39.5	118 23.7	20.8	213 17.5	49.6	125 30.9	24.8	251 17.3	46	18 36.1	− 88
17	19 58.4	36 51.8	38.2	133 24.4	21.1	228 20.2	49.7	140 33.2	24.8	265 40.9	47	18 27.3	− 90
18	35 00.8	51 51.4	− 8 37.0	148 25.1	−21 21.4	243 22.9	+12 49.9	155 35.5	−18 24.9	280 04.6	48	+18 18.3	− 90
19	50 03.3	66 51.1	35.8	163 25.9	21.7	258 25.7	50.0	170 37.8	24.9	294 28.4	48	18 09.3	− 92
20	65 05.8	81 50.7	34.5	178 26.6	22.0	273 28.4	50.1	185 40.0	24.9	308 52.2	49	18 00.1	− 93
21	80 08.2	96 50.4	·· 33.3	193 27.3	·· 22.3	288 31.1	·· 50.2	200 42.3	·· 24.9	323 16.1	50	·17 50.8	− 95
22	95 10.7	111 50.0	32.0	208 28.1	22.5	303 33.9	50.3	215 44.6	25.0	337 40.1	50	17 41.3	− 95
23	110 13.2	126 49.7	30.8	223 28.8	22.8	318 36.6	50.4	230 46.9	25.0	352 04.1	52	17 31.8	− 97
27 0	125 15.6	141 49.3	− 8 29.6	238 29.5	−21 23.1	333 39.3	+12 50.5	245 49.2	−18 25.0	6 28.3	52	+17 22.1	− 98
1	140 18.1	156 49.0	28.3	253 30.3	23.4	348 42.0	50.6	260 51.4	25.1	20 52.5	53	17 12.3	− 99
2	155 20.5	171 48.7	27.1	268 31.0	23.7	3 44.8	50.7	275 53.7	25.1	35 16.8	53	17 02.4	−101
3	170 23.0	186 48.3	·· 25.8	283 31.7	·· 24.0	18 47.5	·· 50.8	290 56.0	·· 25.1	49 41.1	54	·16 52.3	−101
4	185 25.5	201 48.0	24.6	298 32.4	24.3	33 50.2	50.9	305 58.3	25.2	64 05.5	56	16 42.2	−103
5	200 27.9	216 47.6	23.4	313 33.2	24.5	48 53.0	51.0	321 00.5	25.2	78 30.1	55	16 31.9	−104
6	215 30.4	231 47.3	− 8 22.1	328 33.9	−21 24.8	63 55.7	+12 51.1	336 02.8	−18 25.2	92 54.6	57	+16 21.5	−105
7	230 32.9	246 46.9	20.9	343 34.6	25.1	78 58.4	51.2	351 05.1	25.3	107 19.3	57	16 11.0	−105
8	245 35.3	261 46.6	19.6	358 35.4	25.4	94 01.2	51.3	6 07.4	25.3	121 44.0	59	16 00.5	−107
9	260 37.8	276 46.3	·· 18.4	13 36.1	·· 25.7	109 03.9	·· 51.4	21 09.7	·· 25.3	136 08.9	59	·15 49.8	−108
10	275 40.3	291 45.9	17.1	28 36.8	26.0	124 06.6	51.6	36 12.0	25.3	150 33.8	60	15 39.0	−109
11	290 42.7	306 45.6	15.9	43 37.5	26.2	139 09.4	51.7	51 14.2	25.4	164 58.8	60	15 28.1	−110
12	305 45.2	321 45.2	− 8 14.6	58 38.3	−21 26.5	154 12.1	+12 51.8	66 16.5	−18 25.4	179 23.8	62	+15 17.1	−111
13	320 47.7	336 44.9	13.4	73 39.0	26.8	169 14.9	51.9	81 18.8	25.4	193 49.0	62	15 06.0	−112
14	335 50.1	351 44.5	12.2	88 39.7	27.1	184 17.6	52.0	96 21.1	25.5	208 14.2	63	14 54.8	−113
15	350 52.6	6 44.2	·· 10.9	103 40.5	·· 27.4	199 20.3	·· 52.1	111 23.4	·· 25.5	222 39.5	64	·14 43.5	−114
16	5 55.0	21 43.9	09.7	118 41.2	27.7	214 23.1	52.2	126 25.6	25.5	237 04.9	65	14 32.1	−115
17	20 57.5	36 43.5	08.4	133 41.9	27.9	229 25.8	52.3	141 27.9	25.6	251 30.4	65	14 20.6	−116
18	36 00.0	51 43.2	− 8 07.2	148 42.7	−21 28.2	244 28.5	+12 52.4	156 30.2	−18 25.6	265 55.9	67	+14 09.0	−116
19	51 02.4	66 42.9	05.9	163 43.4	28.5	259 31.3	52.5	171 32.5	25.6	280 21.6	67	13 57.4	−118
20	66 04.9	81 42.5	04.7	178 44.1	28.8	274 34.0	52.6	186 34.8	25.6	294 47.3	68	13 45.6	−118
21	81 07.4	96 42.2	·· 03.4	193 44.8	·· 29.1	289 36.7	·· 52.7	201 37.0	·· 25.7	309 13.1	68	·13 33.8	−119
22	96 09.8	111 41.8	02.2	208 45.6	29.3	304 39.5	52.8	216 39.3	25.7	323 38.9	70	13 21.9	−120
23	111 12.3	126 41.5	8 00.9	223 46.3	29.6	319 42.2	52.9	231 41.6	25.7	338 04.9	71	13 09.9	−120
24	126 14.8	141 41.2	− 7 59.7	238 47.0	−21 29.9	334 44.9	+12 53.0	246 43.9	−18 25.8	352 31.0	71	+12 57.9	−122
ode	–	− 3	+ 12	+ 7	− 3	+ 28	+ 1	+ 23	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
25 0	176 58.4	−19 15.7	7	Acamar	315 50.8	−40 29.0
1	191 58.2	15.1	5	Achernar	335 58.7	−57 27.8
2	206 58.1	14.5	30	Acrux	173 57.1	−62 51.2
3	221 57.9	·· 13.9	19	Adhara	255 46.0	−28 54.9
4	236 57.8	13.3	10	Aldebaran	291 38.5	+16 25.4
5	251 57.6	12.7				
6	266 57.5	−19 12.1	32	Alioth	166 58.1	+56 11.5
7	281 57.3	11.4	34	Alkaid	153 32.6	+49 31.5
8	296 57.2	10.8	55	Al Na'ir	28 38.0	−47 10.5
9	311 57.0	·· 10.2	15	Alnilam	276 29.7	− 1 13.8
10	326 56.9	09.6	25	Alphard	218 38.0	− 8 28.2
11	341 56.7	09.0				
12	356 56.6	−19 08.4	41	Alphecca	126 47.5	+26 51.4
13	11 56.4	07.8	1	Alpheratz	358 28.2	+28 51.1
14	26 56.3	07.2	51	Altair	62 50.5	+ 8 45.1
15	41 56.1	·· 06.6	2	Ankaa	353 58.2	−42 32.8
16	56 56.0	06.0	42	Antares	113 19.2	−26 20.1
17	71 55.8	05.4				
18	86 55.7	−19 04.8	37	Arcturus	146 34.9	+19 24.4
19	101 55.5	04.2	43	Atria	109 00.0	−68 56.8
20	116 55.4	03.6	22	Avior	234 35.0	−59 22.2
21	131 55.2	·· 02.9	13	Bellatrix	279 17.9	+ 6 18.6
22	146 55.1	02.3	16	Betelg'se	271 47.6	+ 7 23.9
23	161 55.0	01.7				
			17	Canopus	264 14.8	−52 40.5
26 0	176 54.8	−19 01.1	12	Capella	281 37.7	+45 57.4
1	191 54.7	19 00.5	53	Deneb	50 01.3	+45 07.4
2	206 54.5	18 59.9	28	Denebola	183 17.2	+14 48.8
3	221 54.4	·· 59.3	4	Diphda	349 39.1	−18 13.7
4	236 54.2	58.7				
5	251 54.1	58.0	27	Dubhe	194 43.7	+61 59.0
6	266 54.0	−18 57.4	14	Elnath	279 06.7	+28 34.3
7	281 53.8	56.8	47	Eltanin	91 06.5	+51 29.4
8	296 53.7	56.2	54	Enif	34 29.6	+ 9 40.4
9	311 53.5	·· 55.6	56	Fomalhaut	16 11.6	−29 51.4
10	326 53.4	54.9				
11	341 53.3	54.3	31	Gacrux	172 48.6	−56 51.9
12	356 53.1	−18 53.7	29	Gienah	176 36.4	−17 18.0
13	11 53.0	53.1	35	Hadar	149 49.0	−60 09.6
14	26 52.8	52.5	6	Hamal	328 49.3	+23 15.5
15	41 52.7	·· 51.8	48	Kaus Aust.	84 41.2	−34 24.4
16	56 52.6	51.2				
17	71 52.4	50.6	40	Kochab	137 18.2	+74 19.7
18	86 52.3	−18 50.0	57	Markab	14 21.4	+14 58.2
19	101 52.1	49.3	8	Menkar	315 00.0	+ 3 55.1
20	116 52.0	48.7	36	Menkent	148 58.3	−36 09.2
21	131 51.9	·· 48.1	24	Miapl'dus	221 48.0	−69 32.2
22	146 51.7	47.5				
23	161 51.6	46.8	9	Mirfak	309 41.8	+49 42.6
			50	Nunki	76 51.9	−26 21.1
27 0	176 51.5	−18 46.2	52	Peacock	54 27.5	−56 52.6
1	191 51.3	45.6	21	Pollux	244 19.9	+28 07.9
2	206 51.2	45.0	20	Procyon	245 44.4	+ 5 20.2
3	221 51.1	·· 44.3				
4	236 50.9	43.7	46	R'alhague	96 46.6	+12 35.3
5	251 50.8	43.1	26	Regulus	208 28.9	+12 10.7
6	266 50.7	−18 42.4	11	Rigel	281 53.1	− 8 15.2
7	281 50.5	41.8	38	Rigil Kent.	140 50.6	−60 39.2
8	296 50.4	41.2	44	Sabik	103 02.1	−15 40.3
9	311 50.3	·· 40.5				
10	326 50.1	39.9	3	Schedar	350 29.9	+56 18.1
11	341 50.0	39.3	45	Shaula	97 20.6	−37 04.3
12	356 49.9	−18 38.6	18	Sirius	259 11.3	−16 39.4
13	11 49.7	38.0	33	Spica	159 16.5	−10 56.1
14	26 49.6	37.4	23	Suhail	223 23.7	−43 15.4
15	41 49.5	·· 36.7				
16	56 49.3	36.1	49	Vega	81 08.5	+38 44.4
17	71 49.2	35.5	39	Zub'g'bi	137 53.1	−15 51.7
18	86 49.1	−18 34.8				
19	101 49.0	34.2				
20	116 48.8	33.5				
21	131 48.7	·· 32.9				
22	146 48.6	32.3				
23	161 48.4	31.6				
24	176 48.3	−18 31.0				
code	—	+ 6				

GMT	Equation of Time (App.—Mean) 25	26	27
h	m s	m s	m s
0	−12 06.2	−12 20.5	−12 33.9
6	−12 09.9	−12 23.9	−12 37.1
12	−12 13.4	−12 27.3	−12 40.3
18	−12 17.0	−12 30.6	−12 43.4
24	−12 20.5	−12 33.9	−12 46.5

Lat.	Sunrise	Twlt. begins	Moonrise 25	26	27	28
N °	h m	h m	h m	h m	h m	h m
72	▬	6 14	▭	▭	14 34	17 09
70	10 27	6 11	▭	12 23	15 08	17 24
68	9 47	6 09	10 45	13 19	15 32	17 36
66	9 20	6 07	11 55	13 51	15 51	17 46
64	9 00	6 05	12 31	14 15	16 05	17 54
62	8 43	6 03	12 57	14 34	16 18	18 01
60	8 29	6 00	13 17	14 50	16 28	18 07
58	8 18	5 58	13 34	15 03	16 37	18 12
56	8 07	5 56	13 48	15 14	16 45	18 17
54	7 58	5 55	14 00	15 24	16 52	18 21
52	7 50	5 52	14 11	15 33	16 59	18 25
50	7 43	5 50	14 20	15 40	17 04	18 28
45	7 27	5 46	14 40	15 57	17 17	18 35
40	7 14	5 41	14 57	16 11	17 27	18 42
35	7 03	5 36	15 10	16 22	17 35	18 47
30	6 54	5 31	15 22	16 32	17 43	18 51
20	6 37	5 21	15 43	16 50	17 56	19 00
10	6 23	5 10	16 00	17 05	18 07	19 07
0	6 09	4 56	16 17	17 19	18 18	19 13
10	5 55	4 40	16 34	17 33	18 28	19 20
20	5 40	4 19	16 51	17 48	18 39	19 27
30	5 23	3 51	17 12	18 05	18 52	19 35
35	5 12	3 32	17 23	18 15	19 00	19 39
40	5 01	3 08	17 37	18 26	19 08	19 44
45	4 47	2 36	17 53	18 39	19 18	19 50
50	4 30	1 44	18 13	18 55	19 29	19 57
52	4 22	1 05	18 22	19 03	19 35	20 01
54	4 13	////	18 32	19 11	19 41	20 04
56	4 03	////	18 44	19 20	19 47	20 08
58	3 51	////	18 58	19 31	19 54	20 12
60	3 38	////	19 14	19 43	20 03	20 17
S						

Lat.	Sunset	Twlt. ends	Moonset 25	26	27	28
N °	h m	h m	h m	h m	h m	h m
72	▬	18 14	▭	▭	9 52	9 16
70	13 59	18 17	▭	9 56	9 16	8 58
68	14 38	18 19	9 23	9 00	8 51	8 44
66	15 05	18 21	8 12	8 26	8 31	8 33
64	15 26	18 23	7 36	8 02	8 15	8 23
62	15 42	18 25	7 10	7 42	8 02	8 15
60	15 56	18 27	6 49	7 26	7 50	8 08
58	16 08	18 29	6 32	7 12	7 40	8 01
56	16 18	18 30	6 18	7 01	7 32	7 55
54	16 27	18 32	6 05	6 50	7 24	7 50
52	16 35	18 34	5 54	6 41	7 17	7 46
50	16 43	18 36	5 45	6 33	7 11	7 42
45	16 58	18 40	5 24	6 15	6 57	7 32
40	17 11	18 45	5 07	6 00	6 46	7 25
35	17 22	18 50	4 53	5 48	6 36	7 18
30	17 31	18 54	4 41	5 37	6 27	7 12
20	17 48	19 04	4 20	5 18	6 12	7 02
10	18 02	19 15	4 01	5 02	5 59	6 53
0	18 16	19 29	3 44	4 47	5 47	6 44
10	18 30	19 45	3 27	4 31	5 35	6 36
20	18 45	20 05	3 08	4 15	5 21	6 27
30	19 02	20 32	2 47	3 55	5 06	6 16
35	19 12	20 50	2 34	3 44	4 57	6 10
40	19 24	21 14	2 19	3 31	4 47	6 03
45	19 37	21 45	2 02	3 16	4 34	5 54
50	19 54	22 36	1 41	2 57	4 20	5 44
52	20 02	23 11	1 30	2 48	4 13	5 39
54	20 11	////	1 19	2 38	4 05	5 34
56	20 21	////	1 06	2 26	3 56	5 29
58	20 32	////	0 50	2 13	3 46	5 22
60	20 45	////	0 32	1 58	3 35	5 15
S						

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
25	22 32	14 32	8 08	1 54	7 43
26	23 33	14 33	8 07	1 49	7 39
27	24 31	14 33	8 06	1 45	7 36
28	0 31	14 34	8 05	1 41	7 32

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.6	0.1	0.1
30	0.6	0.1	0.1
45	0.6	0.1	0.0
60	0.6	0.0	0.0
75	0.6	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	25	26	27
°	′	′	′
0	20.6	20.8	20.6
4	20.6	20.7	20.6
8	20.6	20.7	20.6
12	20.5	20.6	20.5
16	20.4	20.6	20.4
20	20.4	20.5	20.4
24	20.2	20.4	20.2
28	20.1	20.2	20.1
32	20.0	20.1	20.0
36	19.8	19.9	19.8
40	19.6	19.7	19.6
44	19.4	19.5	19.4
48	19.2	19.3	19.2
52	19.0	19.1	19.0
56	18.8	18.8	18.8
60	18.5	18.6	18.5
64	18.3	18.3	18.3
68	18.0	18.1	18.0
72	17.7	17.8	17.7
76	17.5	17.5	17.5
80	17.2	17.2	17.2
84	16.9	17.0	16.9
88	16.7	16.7	16.7
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	25	26	27
°	′	′	′
0	12.6	12.6	12.6
4	12.7	12.6	12.7
8	12.7	12.6	12.7
12	12.8	12.7	12.8
16	12.8	12.8	12.8
20	12.9	12.9	12.9
24	13.0	13.0	13.0
28	13.2	13.1	13.2
32	13.3	13.3	13.3
36	13.5	13.4	13.5
40	13.7	13.6	13.7
44	13.9	13.8	13.9
48	14.1	14.0	14.1
52	14.3	14.3	14.3
56	14.5	14.5	14.5
60	14.8	14.7	14.8
64	15.0	15.0	15.0
68	15.3	15.3	15.3
72	15.5	15.5	15.5
76	15.8	15.8	15.8
80	16.1	16.1	16.1
84	16.4	16.4	16.4
88	16.6	16.6	16.6
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS — 3.5 GHA	VENUS — 3.5 Dec	MARS 1.5 GHA	MARS 1.5 Dec	JUPITER — 2.0 GHA	JUPITER — 2.0 Dec.	SATURN 0.8 GHA	SATURN 0.8 Dec	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
28 0	126 14.8	141 41.2	− 7 59.7	238 47.0	−21 29.9	334 44.9	+12 53.0	246 43.9	−18 25.8	352 31.0	71	+12 57.9	−122
1	141 17.2	156 40.8	58.4	253 47.7	30.2	349 47.7	53.2	261 46.2	25.8	6 57.1	72	12 45.7	−122
2	156 19.7	171 40.5	57.2	268 48.5	30.5	4 50.4	53.3	276 48.5	25.8	21 23.3	73	12 33.5	−123
3	171 22.1	186 40.2	·· 55.9	283 49.2	·· 30.7	19 53.2	·· 53.4	291 50.7	·· 25.8	35 49.6	74	·12 21.2	−123
4	186 24.6	201 39.8	54.7	298 49.9	31.0	34 55.9	53.5	306 53.0	25.9	50 16.0	74	12 08.9	−124
5	201 27.1	216 39.5	53.4	313 50.7	31.3	49 58.6	53.6	321 55.3	25.9	64 42.4	75	11 56.5	−125
6	216 29.5	231 39.2	− 7 52.2	328 51.4	−21 31.6	65 01.4	+12 53.7	336 57.6	−18 25.9	79 08.9	77	+11 44.0	−126
7	231 32.0	246 38.8	50.9	343 52.1	31.8	80 04.1	53.8	351 59.9	26.0	93 35.6	76	11 31.4	−126
8	246 34.5	261 38.5	49.7	358 52.8	32.1	95 06.8	53.9	7 02.2	26.0	108 02.2	78	11 18.8	−127
9	261 36.9	276 38.2	·· 48.4	13 53.6	·· 32.4	110 09.6	·· 54.0	22 04.4	·· 26.0	122 29.0	79	·11 06.1	−127
10	276 39.4	291 37.8	47.2	28 54.3	32.7	125 12.3	54.1	37 06.7	26.1	136 55.9	79	10 53.4	−128
11	291 41.9	306 37.5	45.9	43 55.0	32.9	140 15.1	54.2	52 09.0	26.1	151 22.8	80	10 40.6	−129
12	306 44.3	321 37.2	− 7 44.7	58 55.7	−21 33.2	155 17.8	+12 54.3	67 11.3	−18 26.1	165 49.8	81	+10 27.7	−129
13	321 46.8	336 36.8	43.4	73 56.5	33.5	170 20.5	54.4	82 13.6	26.1	180 16.9	82	10 14.8	−129
14	336 49.3	351 36.5	42.2	88 57.2	33.8	185 23.3	54.6	97 15.9	26.2	194 44.1	82	10 01.9	−130
15	351 51.7	6 36.2	·· 40.9	103 57.9	·· 34.0	200 26.0	·· 54.7	112 18.1	·· 26.2	209 11.3	84	· 9 48.9	−131
16	6 54.2	21 35.9	39.7	118 58.6	34.3	215 28.7	54.8	127 20.4	26.2	223 38.7	84	9 35.8	−131
17	21 56.6	36 35.5	38.4	133 59.4	34.6	230 31.5	54.9	142 22.7	26.3	238 06.1	84	9 22.7	−131
18	36 59.1	51 35.2	− 7 37.2	149 00.1	−21 34.9	245 34.2	+12 55.0	157 25.0	−18 26.3	252 33.5	86	+ 9 09.6	−132
19	52 01.6	66 34.9	35.9	164 00.8	35.1	260 37.0	55.1	172 27.3	26.3	267 01.1	86	8 56.4	−133
20	67 04.0	81 34.5	34.7	179 01.5	35.4	275 39.7	55.2	187 29.6	26.3	281 28.7	87	8 43.1	−132
21	82 06.5	96 34.2	·· 33.4	194 02.3	·· 35.7	290 42.5	·· 55.3	202 31.9	·· 26.4	295 56.4	88	· 8 29.9	−134
22	97 09.0	111 33.9	32.1	209 03.0	36.0	305 45.2	55.4	217 34.1	26.4	310 24.2	89	8 16.5	−133
23	112 11.4	126 33.6	30.9	224 03.7	36.2	320 47.9	55.5	232 36.4	26.4	324 52.1	89	8 03.2	−134
29 0	127 13.9	141 33.2	− 7 29.6	239 04.4	−21 36.5	335 50.7	+12 55.6	247 38.7	−18 26.5	339 20.0	90	+ 7 49.8	−134
1	142 16.4	156 32.9	28.4	254 05.2	36.8	350 53.4	55.7	262 41.0	26.5	353 48.0	90	7 36.4	−134
2	157 18.8	171 32.6	27.1	269 05.9	37.1	5 56.2	55.9	277 43.3	26.5	8 16.0	92	7 23.0	−135
3	172 21.3	186 32.3	·· 25.9	284 06.6	·· 37.3	20 58.9	·· 56.0	292 45.6	·· 26.5	22 44.2	92	· 7 09.5	−135
4	187 23.8	201 31.9	24.6	299 07.3	37.6	36 01.6	56.1	307 47.9	26.6	37 12.4	93	6 56.0	−135
5	202 26.2	216 31.6	23.3	314 08.1	37.9	51 04.4	56.2	322 50.1	26.6	51 40.7	93	6 42.5	−136
6	217 28.7	231 31.3	− 7 22.1	329 08.8	−21 38.1	66 07.1	+12 56.3	337 52.4	−18 26.6	66 09.0	94	+ 6 28.9	−136
7	232 31.1	246 31.0	20.8	344 09.5	38.4	81 09.9	56.4	352 54.7	26.7	80 37.4	95	6 15.3	−136
8	247 33.6	261 30.6	19.6	359 10.2	38.7	96 12.6	56.5	7 57.0	26.7	95 05.9	96	6 01.7	−136
9	262 36.1	276 30.3	·· 18.3	14 10.9	·· 38.9	111 15.3	·· 56.6	22 59.3	·· 26.7	109 34.5	96	· 5 48.1	−136
10	277 38.5	291 30.0	17.1	29 11.7	39.2	126 18.1	56.7	38 01.6	26.7	124 03.1	97	5 34.5	−137
11	292 41.0	306 29.7	15.8	44 12.4	39.5	141 20.8	56.8	53 03.9	26.8	138 31.8	97	5 20.8	−136
12	307 43.5	321 29.4	− 7 14.5	59 13.1	−21 39.7	156 23.6	+12 56.9	68 06.2	−18 26.8	153 00.5	98	+ 5 07.2	−137
13	322 45.9	336 29.0	13.3	74 13.8	40.0	171 26.3	57.1	83 08.4	26.8	167 29.3	99	4 53.5	−137
14	337 48.4	351 28.7	12.0	89 14.6	40.3	186 29.1	57.2	98 10.7	26.9	181 58.2	99	4 39.8	−137
15	352 50.9	6 28.4	·· 10.8	104 15.3	·· 40.6	201 31.8	·· 57.3	113 13.0	·· 26.9	196 27.1	100	· 4 26.1	−137
16	7 53.3	21 28.1	09.5	119 16.0	40.8	216 34.6	57.4	128 15.3	26.9	210 56.1	101	4 12.4	−137
17	22 55.8	36 27.8	08.2	134 16.7	41.1	231 37.3	57.5	143 17.6	26.9	225 25.2	101	3 58.7	−137
18	37 58.3	51 27.4	− 7 07.0	149 17.5	−21 41.4	246 40.0	+12 57.6	158 19.9	−18 27.0	239 54.3	101	+ 3 45.0	−137
19	53 00.7	66 27.1	05.7	164 18.2	41.6	261 42.8	57.7	173 22.2	27.0	254 23.4	103	3 31.3	−138
20	68 03.2	81 26.8	04.4	179 18.9	41.9	276 45.5	57.8	188 24.5	27.0	268 52.7	103	3 17.5	−137
21	83 05.6	96 26.5	·· 03.2	194 19.6	·· 42.2	291 48.3	·· 57.9	203 26.8	·· 27.1	283 22.0	103	· 3 03.8	−137
22	98 08.1	111 26.2	01.9	209 20.3	42.4	306 51.0	58.0	218 29.0	27.1	297 51.3	104	2 50.1	−137
23	113 10.6	126 25.8	7 00.7	224 21.1	42.7	321 53.8	58.1	233 31.3	27.1	312 20.7	105	2 36.4	−138
30 0	128 13.0	141 25.5	− 6 59.4	239 21.8	−21 43.0	336 56.5	+12 58.3	248 33.6	−18 27.1	326 50.2	105	+ 2 22.6	−137
1	143 15.5	156 25.2	58.1	254 22.5	43.2	351 59.3	58.4	263 35.9	27.2	341 19.7	105	2 08.9	−137
2	158 18.0	171 24.9	56.9	269 23.2	43.5	7 02.0	58.5	278 38.2	27.2	355 49.2	106	1 55.2	−137
3	173 20.4	186 24.6	·· 55.6	284 24.0	·· 43.7	22 04.7	·· 58.6	293 40.5	·· 27.2	10 18.8	107	· 1 41.5	−137
4	188 22.9	201 24.3	54.3	299 24.7	44.0	37 07.5	58.7	308 42.8	27.3	24 48.5	107	1 27.8	−136
5	203 25.4	216 24.0	53.1	314 25.4	44.3	52 10.2	58.8	323 45.1	27.3	39 18.2	108	1 14.2	−137
6	218 27.8	231 23.6	− 6 51.8	329 26.1	−21 44.5	67 13.0	+12 58.9	338 47.4	−18 27.3	53 48.0	108	+ 1 00.5	−137
7	233 30.3	246 23.3	50.5	344 26.8	44.8	82 15.7	59.0	353 49.7	27.3	68 17.8	108	0 46.8	−136
8	248 32.7	261 23.0	49.3	359 27.6	45.1	97 18.5	59.1	8 51.9	27.4	82 47.6	109	0 33.2	−136
9	263 35.2	276 22.7	·· 48.0	14 28.3	·· 45.3	112 21.2	·· 59.2	23 54.2	·· 27.4	97 17.5	110	· 0 19.6	−136
10	278 37.7	291 22.4	46.7	29 29.0	45.6	127 24.0	59.4	38 56.5	27.4	111 47.5	110	+ 0 06.0	−136
11	293 40.1	306 22.1	45.5	44 29.7	45.8	142 26.7	59.5	53 58.8	27.4	126 17.5	110	− 0 07.6	−136
12	308 42.6	321 21.8	− 6 44.2	59 30.4	−21 46.1	157 29.5	+12 59.6	69 01.1	−18 27.5	140 47.5	111	− 0 21.2	−135
13	323 45.1	336 21.5	42.9	74 31.2	46.4	172 32.2	59.7	84 03.4	27.5	155 17.6	111	0 34.7	−136
14	338 47.5	351 21.1	41.7	89 31.9	46.6	187 35.0	59.8	99 05.7	27.5	169 47.7	112	0 48.3	−135
15	353 50.0	6 20.8	·· 40.4	104 32.6	·· 46.9	202 37.7	·12 59.9	114 08.0	·· 27.6	184 17.9	112	· 1 01.8	−134
16	8 52.5	21 20.5	39.1	119 33.3	47.2	217 40.4	13 00.0	129 10.3	27.6	198 48.1	113	1 15.2	−135
17	23 54.9	36 20.2	37.9	134 34.0	47.4	232 43.2	00.1	144 12.6	27.6	213 18.4	113	1 28.7	−134
18	38 57.4	51 19.9	− 6 36.6	149 34.8	−21 47.7	247 45.9	+13 00.2	159 14.9	−18 27.6	227 48.7	113	− 1 42.1	−134
19	53 59.9	66 19.6	35.3	164 35.5	47.9	262 48.7	00.3	174 17.1	27.7	242 19.0	113	1 55.5	−134
20	69 02.3	81 19.3	34.1	179 36.2	48.2	277 51.4	00.5	189 19.4	27.7	256 49.3	114	2 08.9	−133
21	84 04.8	96 19.0	·· 32.8	194 36.9	·· 48.5	292 54.2	·· 00.6	204 21.7	·· 27.7	271 19.7	115	· 2 22.2	−133
22	99 07.2	111 18.7	31.5	209 37.6	48.7	307 56.9	00.7	219 24.0	27.7	285 50.2	114	2 35.5	−133
23	114 09.7	126 18.4	30.2	224 38.4	49.0	322 59.7	00.8	234 26.3	27.8	300 20.6	115	2 48.8	−132
24	129 12.2	141 18.1	− 6 29.0	239 39.1	−21 49.2	338 02.4	+13 00.9	249 28.6	−18 27.8	314 51.1	116	− 3 02.0	−132
code	—	− 4	+ 12	+ 7	− 3	+ 27	+ 2	+ 22	0				

G M T	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
28 0	176 48.3	−18 31.0	7	Acamar	315 50.8	−40 29.0
1	191 48.2	30.3	5	Achernar	335 58.8	−57 27.8
2	206 48.1	29.7	30	Acrux	173 57.1	−62 51.3
3	221 47.9	29.1	19	Adhara	255 46.0	−28 54.9
4	236 47.8	28.4	10	Aldebaran	291 38.6	+16 25.4
5	251 47.7	27.8				
6	266 47.6	−18 27.1	32	Alioth	166 58.1	+56 11.5
7	281 47.4	26.5	34	Alkaid	153 32.6	+49 31.5
8	296 47.3	25.8	55	Al Na'ir	28 38.0	−47 10.5
9	311 47.2	25.2	15	Alnilam	276 29.7	− 1 13.8
10	326 47.1	24.5	25	Alphard	218 38.0	− 8 28.2
11	341 46.9	23.9				
12	356 46.8	−18 23.2	41	Alphecca	126 47.5	+26 51.4
13	11 46.7	22.6	1	Alpheratz	358 28.2	+28 51.1
14	26 46.6	21.9	51	Altair	62 50.5	+ 8 45.1
15	41 46.4	21.3	2	Ankaa	353 58.2	−42 32.8
16	56 46.3	20.6	42	Antares	113 19.2	−26 20.1
17	71 46.2	20.0				
18	86 46.1	−18 19.3	37	Arcturus	146 34.9	+19 24.4
19	101 46.0	18.7	43	Atria	109 00.0	−68 56.8
20	116 45.8	18.0	22	Avior	234 35.0	−59 22.2
21	131 45.7	17.4	13	Bellatrix	279 17.9	+ 6 18.6
22	146 45.6	16.7	16	Betelg'se	271 47.6	+ 7 23.9
23	161 45.5	16.1				
			17	Canopus	264 14.8	−52 40.5
29 0	176 45.4	−18 15.4	12	Capella	281 37.7	+45 57.4
1	191 45.2	14.8	53	Deneb	50 01.3	+45 07.4
2	206 45.1	14.1	28	Denebola	183 17.2	+14 48.8
3	221 45.0	13.4	4	Diphda	349 39.1	−18 13.7
4	236 44.9	12.8				
5	251 44.8	12.1	27	Dubhe	194 43.7	+61 59.0
6	266 44.7	−18 11.5	14	Elnath	279 06.7	+28 34.3
7	281 44.5	10.8	47	Eltanin	91 06.5	+51 29.4
8	296 44.4	10.1	54	Enif	34 29.6	+ 9 40.4
9	311 44.3	09.5	56	Fomalhaut	16 11.6	−29 51.4
10	326 44.2	08.8				
11	341 44.1	08.2	31	Gacrux	172 48.6	−56 52.0
12	356 44.0	−18 07.5	29	Gienah	176 36.4	−17 18.0
13	11 43.9	06.8	35	Hadar	149 48.9	−60 09.6
14	26 43.7	06.2	6	Hamal	328 49.3	+23 15.5
15	41 43.6	05.5	48	Kaus Aust.	84 41.1	−34 24.4
16	56 43.5	04.8				
17	71 43.4	04.2	40	Kochab	137 18.1	+74 19.7
18	86 43.3	−18 03.5	57	Markab	14 21.4	+14 58.2
19	101 43.2	02.9	8	Menkar	315 00.0	+ 3 55.1
20	116 43.1	02.2	36	Menkent	148 58.3	−36 09.2
21	131 43.0	01.5	24	Miapl'dus	221 48.0	−69 32.2
22	146 42.8	00.8				
23	161 42.7	18 00.2	9	Mirfak	309 41.8	+49 42.6
			50	Nunki	76 51.9	−26 21.1
30 0	176 42.6	−17 59.5	52	Peacock	54 27.4	−56 52.6
1	191 42.5	58.8	21	Pollux	244 19.9	+28 07.9
2	206 42.4	58.2	20	Procyon	245 44.4	+ 5 20.2
3	221 42.3	57.5				
4	236 42.2	56.8	46	R'alhague	96 46.6	+12 35.3
5	251 42.1	56.2	26	Regulus	208 28.9	+12 10.7
6	266 42.0	−17 55.5	11	Rigel	281 53.1	− 8 15.2
7	281 41.9	54.8	38	Rigil Kent.	140 50.6	−60 39.2
8	296 41.7	54.1	44	Sabik	103 02.1	−15 40.3
9	311 41.6	53.5				
10	326 41.5	52.8	3	Schedar	350 29.9	+56 18.1
11	341 41.4	52.1	45	Shaula	97 20.6	−37 04.3
12	356 41.3	−17 51.4	18	Sirius	259 11.3	−16 39.5
13	11 41.2	50.8	33	Spica	159 16.5	−10 56.1
14	26 41.1	50.1	23	Suhail	223 23.7	−43 15.4
15	41 41.0	49.4				
16	56 40.9	48.7	49	Vega	81 08.4	+38 44.4
17	71 40.8	48.1	39	Zub'g'bi	137 53.1	−15 51.7
18	86 40.7	−17 47.4				
19	101 40.6	46.7				
20	116 40.5	46.0				
21	131 40.4	45.3				
22	146 40.3	44.7				
23	161 40.2	44.0				
24	176 40.1	−17 43.3				
code	—	+ 7				

G M T	Equation of Time (App. − Mean) 28	29	30
h	m s	m s	m s
0	−12 46.5	−12 58.3	−13 09.3
6	−12 49.5	−13 01.1	−13 11.9
12	−12 52.5	−13 03.9	−13 14.5
18	−12 55.4	−13 06.6	−13 17.0
24	−12 58.3	−13 09.3	−13 19.5

Lat.	Sunrise	Twlt. begins	Moonrise 28	29	30	31
N °	h m	h m	h m	h m	h m	h m
72	11 06	6 06	17 09	19 23	21 28	23 31
70	10 08	6 04	17 24	19 27	21 24	23 18
68	9 34	6 03	17 36	19 31	21 21	23 08
66	9 10	6 01	17 46	19 35	21 19	22 59
64	8 51	5 59	17 54	19 37	21 17	22 52
62	8 36	5 57	18 01	19 40	21 15	22 46
60	8 23	5 55	18 07	19 42	21 13	22 41
58	8 12	5 54	18 12	19 44	21 12	22 37
56	8 02	5 52	18 17	19 45	21 10	22 32
54	7 54	5 51	18 21	19 47	21 09	22 29
52	7 46	5 49	18 25	19 48	21 08	22 25
50	7 39	5 47	18 28	19 49	21 07	22 22
45	7 24	5 43	18 35	19 52	21 05	22 16
40	7 12	5 39	18 42	19 54	21 04	22 11
35	7 02	5 35	18 47	19 56	21 02	22 06
30	6 53	5 30	18 51	19 58	21 01	22 02
20	6 37	5 21	19 00	20 00	20 59	21 55
10	6 23	5 10	19 07	20 03	20 57	21 49
0	6 10	4 57	19 13	20 05	20 55	21 43
10	5 56	4 41	19 20	20 08	20 53	21 38
20	5 42	4 21	19 27	20 10	20 52	21 32
30	5 25	3 54	19 35	20 13	20 50	21 25
35	5 15	3 36	19 39	20 15	20 49	21 21
40	5 04	3 14	19 44	20 17	20 47	21 17
45	4 51	2 44	19 50	20 19	20 46	21 12
50	4 35	1 55	19 57	20 22	20 44	21 06
52	4 27	1 23	20 01	20 23	20 43	21 04
54	4 19	////	20 04	20 24	20 42	21 01
56	4 09	////	20 08	20 26	20 42	20 57
58	3 58	////	20 12	20 27	20 40	20 54
60	3 45	////	20 17	20 29	20 39	20 50
S						

Lat.	Sunset	Twlt. ends	Moonset 28	29	30	31
N °	h m	h m	h m	h m	h m	h m
72	13 21	18 24	9 16	8 53	8 33	8 15
70	14 19	18 26	8 58	8 45	8 33	8 21
68	14 53	18 28	8 44	8 38	8 33	8 27
66	15 17	18 29	8 33	8 33	8 32	8 32
64	15 36	18 30	8 23	8 28	8 32	8 36
62	15 51	18 31	8 15	8 24	8 32	8 39
60	16 04	18 33	8 08	8 21	8 32	8 42
58	16 15	18 34	8 01	8 17	8 31	8 45
56	16 25	18 36	7 55	8 15	8 31	8 47
54	16 33	18 37	7 50	8 12	8 31	8 49
52	16 41	18 39	7 46	8 10	8 31	8 51
50	16 48	18 41	7 42	8 08	8 31	8 53
45	17 02	18 44	7 32	8 03	8 31	8 57
40	17 14	18 47	7 25	7 59	8 31	9 01
35	17 25	18 52	7 18	7 56	8 30	9 04
30	17 34	18 56	7 12	7 53	8 30	9 06
20	17 50	19 06	7 02	7 47	8 30	9 11
10	18 04	19 17	6 53	7 43	8 29	9 15
0	18 17	19 29	6 44	7 38	8 29	9 18
10	18 30	19 44	6 36	7 34	8 29	9 22
20	18 44	20 04	6 27	7 29	8 29	9 26
30	19 01	20 31	6 16	7 23	8 28	9 30
35	19 10	20 47	6 10	7 20	8 28	9 33
40	19 21	21 10	6 03	7 16	8 27	9 36
45	19 34	21 40	5 54	7 12	8 27	9 39
50	19 50	22 26	5 44	7 07	8 27	9 43
52	19 58	22 56	5 39	7 04	8 26	9 45
54	20 06	////	5 34	7 02	8 26	9 47
56	20 16	////	5 29	6 59	8 26	9 50
58	20 26	////	5 22	6 56	8 26	9 52
60	20 39	////	5 15	6 52	8 25	9 55
S						

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
28	0 31	14 34	8 05	1 41	7 32
29	1 26	14 34	8 03	1 36	7 28
30	2 17	14 35	8 02	1 32	7 25
31	3 07	14 35	8 01	1 28	7 21

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.6	0.1	0.1
30	0.6	0.1	0.1
45	0.6	0.1	0.0
60	0.6	0.0	0.0
75	0.6	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	28	29	30
°	′	′	′
0	20.0	19.1	18.1
4	20.0	19.1	18.1
8	20.0	19.1	18.1
12	19.9	19.0	18.0
16	19.8	19.0	18.0
20	19.8	18.9	18.0
24	19.6	18.8	17.9
28	19.5	18.7	17.8
32	19.4	18.6	17.8
36	19.3	18.5	17.7
40	19.1	18.4	17.6
44	18.9	18.3	17.5
48	18.8	18.1	17.4
52	18.6	18.0	17.3
56	18.4	17.8	17.2
60	18.1	17.6	17.0
64	17.9	17.5	16.9
68	17.7	17.3	16.8
72	17.5	17.1	16.6
76	17.2	16.9	16.5
80	17.0	16.7	16.4
84	16.7	16.5	16.2
88	16.6	16.4	16.1
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	28	29	30
°	′	′	′
0	13.0	13.5	14.1
4	13.0	13.5	14.1
8	13.1	13.6	14.1
12	13.1	13.6	14.2
16	13.2	13.6	14.2
20	13.3	13.7	14.2
24	13.4	13.8	14.3
28	13.5	13.9	14.4
32	13.6	14.0	14.4
36	13.7	14.1	14.5
40	13.9	14.2	14.6
44	14.1	14.4	14.7
48	14.3	14.5	14.8
52	14.4	14.7	14.9
56	14.6	14.8	15.0
60	14.9	15.0	15.2
64	15.1	15.2	15.3
68	15.3	15.4	15.4
72	15.5	15.5	15.5
76	15.8	15.7	15.7
80	16.0	15.9	15.8
84	16.3	16.1	16.0
88	16.4	16.3	16.1
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.5 GHA	VENUS Dec	MARS 1.5 GHA	MARS Dec.	JUPITER −2.1 GHA	JUPITER Dec.	SATURN 0.7 GHA	SATURN Dec	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
31 0	129 12.2	141 18.1	− 6 29.0	239 39.1	−21 49.2	338 02.4	+13 00.9	249 28.6	−18 27.8	314 51.1	116	− 3 02.0	−132
1	144 14.6	156 17.7	27.7	254 39.8	49.5	353 05.2	01.0	264 30.9	27.8	329 21.7	115	3 15.2	−132
2	159 17.1	171 17.4	26.4	269 40.5	49.7	8 07.9	01.1	279 33.2	27.9	343 52.2	116	3 28.4	−131
3	174 19.6	186 17.1	·· 25.2	284 41.2	·· 50.0	23 10.7	·· 01.2	294 35.5	·· 27.9	358 22.8	117	· 3 41.5	−131
4	189 22.0	201 16.8	23.9	299 41.9	50.3	38 13.4	01.3	309 37.8	27.9	12 53.5	116	3 54.6	−131
5	204 24.5	216 16.5	22.6	314 42.7	50.5	53 16.2	01.5	324 40.1	27.9	27 24.1	117	4 07.7	−130
6	219 27.0	231 16.2	− 6 21.3	329 43.4	−21 50.8	68 18.9	+13 01.6	339 42.4	−18 28.0	41 54.8	117	− 4 20.7	−129
7	234 29.4	246 15.9	20.1	344 44.1	51.0	83 21.7	01.7	354 44.7	28.0	56 25.5	118	4 33.6	−130
8	249 31.9	261 15.6	18.8	359 44.8	51.3	98 24.4	01.8	9 47.0	28.0	70 56.3	117	4 46.6	−129
9	264 34.4	276 15.3	·· 17.5	14 45.5	·· 51.5	113 27.2	·· 01.9	24 49.3	·· 28.0	85 27.0	118	· 4 59.5	−128
10	279 36.8	291 15.0	16.2	29 46.3	51.8	128 29.9	02.0	39 51.5	28.1	99 57.8	119	5 12.3	−128
11	294 39.3	306 14.7	15.0	44 47.0	52.0	143 32.7	02.1	54 53.8	28.1	114 28.7	118	5 25.1	−127
12	309 41.7	321 14.4	− 6 13.7	59 47.7	−21 52.3	158 35.4	+13 02.2	69 56.1	−18 28.1	128 59.5	119	− 5 37.8	−127
13	324 44.2	336 14.1	12.4	74 48.4	52.6	173 38.2	02.3	84 58.4	28.2	143 30.4	118	5 50.5	−127
14	339 46.7	351 13.8	11.2	89 49.1	52.8	188 40.9	02.5	100 00.7	28.2	158 01.2	120	6 03.2	−126
15	354 49.1	6 13.5	·· 09.9	104 49.8	·· 53.1	203 43.7	·· 02.6	115 03.0	·· 28.2	172 32.2	119	· 6 15.8	−125
16	9 51.6	21 13.2	08.6	119 50.6	53.3	218 46.4	02.7	130 05.3	28.2	187 03.1	119	6 28.3	−126
17	24 54.1	36 12.9	07.3	134 51.3	53.6	233 49.2	02.8	145 07.6	28.3	201 34.0	120	6 40.9	−124
18	39 56.5	51 12.6	− 6 06.1	149 52.0	−21 53.8	248 51.9	+13 02.9	160 09.9	−18 28.3	216 05.0	120	− 6 53.3	−124
19	54 59.0	66 12.3	04.8	164 52.7	54.1	263 54.7	03.0	175 12.2	28.3	230 36.0	120	7 05.7	−123
20	70 01.5	81 12.0	03.5	179 53.4	54.3	278 57.4	03.1	190 14.5	28.3	245 07.0	120	7 18.0	−123
21	85 03.9	96 11.7	·· 02.2	194 54.1	·· 54.6	294 00.2	·· 03.2	205 16.8	·· 28.4	259 38.0	120	· 7 30.3	−123
22	100 06.4	111 11.4	6 00.9	209 54.9	54.8	309 02.9	03.4	220 19.1	28.4	274 09.0	121	7 42.6	−122
23	115 08.8	126 11.1	5 59.7	224 55.6	55.1	324 05.7	03.5	235 21.4	28.4	288 40.1	121	7 54.8	−121
1 0	130 11.3	141 10.8	− 5 58.4	239 56.3	−21 55.3	339 08.5	+13 03.6	250 23.7	−18 28.4	303 11.2	120	− 8 06.9	−120
1	145 13.8	156 10.5	57.1	254 57.0	55.6	354 11.2	03.7	265 26.0	28.5	317 42.2	121	8 18.9	−120
2	160 16.2	171 10.2	55.8	269 57.7	55.8	9 14.0	03.8	280 28.3	28.5	332 13.3	121	8 30.9	−120
3	175 18.7	186 09.9	·· 54.6	284 58.4	·· 56.1	24 16.7	·· 03.9	295 30.6	·· 28.5	346 44.4	122	· 8 42.9	−119
4	190 21.2	201 09.6	53.3	299 59.2	56.3	39 19.5	04.0	310 32.9	28.6	1 15.6	121	8 54.8	−118
5	205 23.6	216 09.3	52.0	314 59.9	56.6	54 22.2	04.1	325 35.2	28.6	15 46.7	121	9 06.6	−118
6	220 26.1	231 09.0	− 5 50.7	330 00.6	−21 56.8	69 25.0	+13 04.2	340 37.5	−18 28.6	30 17.8	122	− 9 18.4	−117
7	235 28.6	246 08.7	49.4	345 01.3	57.1	84 27.7	04.4	355 39.8	28.6	44 49.0	121	9 30.1	−116
8	250 31.0	261 08.4	48.2	0 02.0	57.3	99 30.5	04.5	10 42.1	28.7	59 20.1	122	9 41.7	−116
9	265 33.5	276 08.1	·· 46.9	15 02.7	·· 57.6	114 33.2	·· 04.6	25 44.4	·· 28.7	73 51.3	122	· 9 53.3	−115
10	280 36.0	291 07.8	45.6	30 03.4	57.8	129 36.0	04.7	40 46.7	28.7	88 22.5	121	10 04.8	−114
11	295 38.4	306 07.5	44.3	45 04.2	58.1	144 38.7	04.8	55 49.0	28.7	102 53.6	122	10 16.2	−114
12	310 40.9	321 07.2	− 5 43.0	60 04.9	−21 58.3	159 41.5	+13 04.9	70 51.3	−18 28.8	117 24.8	122	−10 27.6	−113
13	325 43.3	336 06.9	41.8	75 05.6	58.6	174 44.3	05.0	85 53.6	28.8	131 56.0	122	10 38.9	−113
14	340 45.8	351 06.7	40.5	90 06.3	58.8	189 47.0	05.1	100 55.8	28.8	146 27.2	122	10 50.2	−112
15	355 48.3	6 06.4	·· 39.2	105 07.0	·· 59.1	204 49.8	·· 05.3	115 58.1	·· 28.8	160 58.4	122	·11 01.4	−111
16	10 50.7	21 06.1	37.9	120 07.7	59.3	219 52.5	05.4	131 00.4	28.9	175 29.6	122	11 12.5	−110
17	25 53.2	36 05.8	36.6	135 08.5	59.6	234 55.3	05.5	146 02.7	28.9	190 00.8	123	11 23.5	−110
18	40 55.7	51 05.5	− 5 35.4	150 09.2	−21 59.8	249 58.0	+13 05.6	161 05.0	−18 28.9	204 32.1	122	−11 34.5	−109
19	55 58.1	66 05.2	34.1	165 09.9	22 00.0	265 00.8	05.7	176 07.3	28.9	219 03.3	122	11 45.4	−108
20	71 00.6	81 04.9	32.8	180 10.6	00.3	280 03.5	05.8	191 09.6	29.0	233 34.5	122	11 56.2	−107
21	86 03.1	96 04.6	·· 31.5	195 11.3	·· 00.5	295 06.3	·· 05.9	206 11.9	·· 29.0	248 05.7	122	·12 06.9	−107
22	101 05.5	111 04.3	30.2	210 12.0	00.8	310 09.1	06.0	221 14.2	29.0	262 36.9	122	12 17.6	−106
23	116 08.0	126 04.0	29.0	225 12.7	01.0	325 11.8	06.2	236 16.5	29.0	277 08.1	122	12 28.2	−105
2 0	131 10.5	141 03.7	− 5 27.7	240 13.4	−22 01.3	340 14.6	+13 06.3	251 18.8	−18 29.1	291 39.3	123	−12 38.7	−105
1	146 12.9	156 03.4	26.4	255 14.2	01.5	355 17.3	06.4	266 21.1	29.1	306 10.6	122	12 49.2	−104
2	161 15.4	171 03.2	25.1	270 14.9	01.8	10 20.1	06.5	281 23.4	29.1	320 41.8	122	12 59.6	−103
3	176 17.8	186 02.9	·· 23.8	285 15.6	·· 02.0	25 22.8	·· 06.6	296 25.7	·· 29.1	335 13.0	122	·13 09.9	−102
4	191 20.3	201 02.6	22.5	300 16.3	02.2	40 25.6	06.7	311 28.0	29.2	349 44.2	122	13 20.1	−102
5	206 22.8	216 02.3	21.2	315 17.0	02.5	55 28.3	06.8	326 30.3	29.2	4 15.4	122	13 30.3	−100
6	221 25.2	231 02.0	− 5 20.0	330 17.7	−22 02.7	70 31.1	+13 06.9	341 32.6	−18 29.2	18 46.6	122	−13 40.3	−100
7	236 27.7	246 01.7	18.7	345 18.4	03.0	85 33.9	07.1	356 34.9	29.2	33 17.8	122	13 50.3	− 99
8	251 30.2	261 01.4	17.4	0 19.2	03.2	100 36.6	07.2	11 37.2	29.3	47 49.0	122	14 00.2	− 99
9	266 32.6	276 01.1	··· 16.1	15 19.9	·· 03.5	115 39.4	·· 07.3	26 39.5	·· 29.3	62 20.2	122	·14 10.1	− 97
10	281 35.1	291 00.9	14.8	30 20.6	03.7	130 42.1	07.4	41 41.8	29.3	76 51.4	121	14 19.8	− 97
11	296 37.6	306 00.6	13.5	45 21.3	03.9	145 44.9	07.5	56 44.2	29.3	91 22.5	122	14 29.5	− 96
12	311 40.0	321 00.3	− 5 12.3	60 22.0	−22 04.2	160 47.6	+13 07.6	71 46.5	−18 29.4	105 53.7	122	−14 39.1	− 95
13	326 42.5	336 00.0	11.0	75 22.7	04.4	175 50.4	07.7	86 48.8	29.4	120 24.9	121	14 48.6	− 95
14	341 44.9	350 59.7	09.7	90 23.4	04.7	190 53.2	07.9	101 51.1	29.4	134 56.0	122	14 58.1	− 93
15	356 47.4	5 59.4	·· 08.4	105 24.1	·· 04.9	205 55.9	·· 08.0	116 53.4	·· 29.4	149 27.2	121	·15 07.4	− 93
16	11 49.9	20 59.1	07.1	120 24.8	05.1	220 58.7	08.1	131 55.7	29.5	163 58.3	122	15 16.7	− 91
17	26 52.3	35 58.9	05.8	135 25.6	05.4	236 01.4	08.2	146 58.0	29.5	178 29.5	121	15 25.8	− 91
18	41 54.8	50 58.6	− 5 04.5	150 26.3	−22 05.6	251 04.2	+13 08.3	162 00.3	−18 29.5	193 00.6	121	−15 34.9	− 91
19	56 57.3	65 58.3	03.2	165 27.0	05.8	266 07.0	08.4	177 02.6	29.5	207 31.7	121	15 44.0	− 89
20	71 59.7	80 58.0	02.0	180 27.7	06.1	281 09.7	08.5	192 04.9	29.6	222 02.8	121	15 52.9	− 88
21	87 02.2	95 57.7	· 5 00.7	195 28.4	·· 06.3	296 12.5	·· 08.6	207 07.2	·· 29.6	236 33.9	121	·16 01.7	− 88
22	102 04.7	110 57.4	4 59.4	210 29.1	06.6	311 15.2	08.8	222 09.5	29.6	251 05.0	121	16 10.5	− 86
23	117 07.1	125 57.2	58.1	225 29.8	06.8	326 18.0	08.9	237 11.8	29.6	265 36.1	121	16 19.1	− 86
24	132 09.6	140 56.9	− 4 56.8	240 30.5	−22 07.0	341 20.8	+13 09.0	252 14.1	−18 29.7	280 07.2	120	−16 27.7	− 85
code	−	− 3	+ 12	+ 7	− 3	+ 28	+ 1	+ 23	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
31 0	176 40.1	−17 43.3
1	191 40.0	42.6
2	206 39.9	41.9
3	221 39.8	41.2
4	236 39.7	40.6
5	251 39.6	39.9
6	266 39.5	−17 39.2
7	281 39.4	38.5
8	296 39.3	37.8
9	311 39.2	37.1
10	326 39.1	36.4
11	341 39.0	35.7
12	356 38.9	−17 35.1
13	11 38.8	34.4
14	26 38.7	33.7
15	41 38.6	33.0
16	56 38.5	32.3
17	71 38.4	31.6
18	86 38.3	−17 30.9
19	101 38.2	30.2
20	116 38.1	29.5
21	131 38.0	28.8
22	146 37.9	28.1
23	161 37.8	27.4
1 0	176 37.7	−17 26.7
1	191 37.6	26.1
2	206 37.5	25.4
3	221 37.5	24.7
4	236 37.4	24.0
5	251 37.3	23.3
6	266 37.2	−17 22.6
7	281 37.1	21.9
8	296 37.0	21.2
9	311 36.9	20.5
10	326 36.8	19.8
11	341 36.7	19.1
12	356 36.6	−17 18.4
13	11 36.5	17.7
14	26 36.5	17.0
15	41 36.4	16.3
16	56 36.3	15.5
17	71 36.2	14.8
18	86 36.1	−17 14.1
19	101 36.0	13.4
20	116 35.9	12.7
21	131 35.8	12.0
22	146 35.8	11.3
23	161 35.7	10.6
2 0	176 35.6	−17 09.9
1	191 35.5	09.2
2	206 35.4	08.5
3	221 35.3	07.8
4	236 35.2	07.1
5	251 35.2	06.3
6	266 35.1	−17 05.6
7	281 35.0	04.9
8	296 34.9	04.2
9	311 34.8	03.5
10	326 34.7	02.8
11	341 34.7	02.1
12	356 34.6	−17 01.4
13	11 34.5	17 00.6
14	26 34.4	16 59.9
15	41 34.3	59.2
16	56 34.3	58.5
17	71 34.2	57.8
18	86 34.1	−16 57.1
19	101 34.0	56.3
20	116 33.9	55.6
21	131 33.9	54.9
22	146 33.8	54.2
23	161 33.7	53.5
24	176 33.6	−16 52.7
code	−	+ 7

STARS No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 50.9	−40 29.0
5	Achernar	335 58.8	−57 27.8
30	Acrux	173 57.1	−62 51.3
19	Adhara	255 46.0	−28 54.9
10	Aldebaran	291 38.6	+16 25.4
32	Alioth	166 58.0	+56 11.5
34	Alkaid	153 32.5	+49 31.5
55	Al Na'ir	28 38.0	−47 10.5
15	Alnilam	276 29.7	− 1 13.8
25	Alphard	218 38.0	− 8 28.2
41	Alphecca	126 47.5	+26 51.4
1	Alpheratz	358 28.2	+28 51.0
51	Altair	62 50.5	+ 8 45.1
2	Ankaa	353 58.2	−42 32.8
42	Antares	113 19.2	−26 20.1
37	Arcturus	146 34.9	+19 24.3
43	Atria	108 59.9	−68 56.8
22	Avior	234 35.0	−59 22.2
13	Bellatrix	279 17.9	+ 6 18.6
16	Betelg'se	271 47.6	+ 7 23.9
17	Canopus	264 14.8	−52 40.5
12	Capella	281 37.7	+45 57.4
53	Deneb	50 01.3	+45 07.4
28	Denebola	183 17.2	+14 48.8
4	Diphda	349 39.1	−18 13.7
27	Dubhe	194 43.7	+61 59.0
14	Elnath	279 06.7	+28 34.4
47	Eltanin	91 06.5	+51 29.4
54	Enif	34 29.6	+ 9 40.4
56	Fomalhaut	16 11.6	−29 51.4
31	Gacrux	172 48.6	−56 52.0
29	Gienah	176 36.4	−17 18.0
35	Hadar	149 48.9	−60 09.6
6	Hamal	328 49.4	+23 15.5
48	Kaus Aust.	84 41.1	−34 24.4
40	Kochab	137 18.0	+74 19.7
57	Markab	14 21.4	+14 58.2
8	Menkar	315 00.0	+ 3 55.1
36	Menkent	148 58.3	−36 09.3
24	Miapl'dus	221 48.0	−69 32.3
9	Mirfak	309 41.9	+49 42.6
50	Nunki	76 51.9	−26 21.1
52	Peacock	54 27.4	−56 52.6
21	Pollux	244 19.9	+28 07.9
20	Procyon	245 44.4	+ 5 20.2
46	R'alhague	96 46.6	+12 35.3
26	Regulus	208 28.9	+12 10.7
11	Rigel	281 53.1	− 8 15.2
38	Rigil Kent.	140 50.5	−60 39.2
44	Sabik	103 02.0	−15 40.3
3	Schedar	350 29.9	+56 18.1
45	Shaula	97 20.6	−37 04.3
18	Sirius	259 11.3	−16 39.5
33	Spica	159 16.5	−10 56.1
23	Suhail	223 23.7	−43 15.4
49	Vega	81 08.4	+38 44.4
39	Zub'g'bi	137 53.0	−15 51.7

GMT	Equation of Time (App.—Mean) 31	1	2
h	m s	m s	m s
0	−13 19.5	−13 28.9	−13 37.5
6	−13 21.9	−13 31.1	−13 39.5
12	−13 24.3	−13 33.3	−13 41.5
18	−13 26.6	−13 35.4	−13 43.4
24	−13 28.9	−13 37.5	−13 45.3

Lat. N °	Sunrise h m	Twlt. begins h m	Moonrise 31 h m	1 h m	2 h m	3 h m
72	10 35	5 56	23 31	25 39	1 39	4 15
70	9 51	5 55	23 18	25 13	1 13	3 15
68	9 21	5 55	23 08	24 54	0 54	2 40
66	9 00	5 54	22 59	24 38	0 38	2 16
64	8 42	5 53	22 52	24 26	0 26	1 57
62	8 28	5 52	22 46	24 15	0 15	1 41
60	8 16	5 50	22 41	24 06	0 06	1 28
58	8 06	5 50	22 37	23 59	25 17	1 17
56	7 57	5 49	22 32	23 52	25 08	1 08
54	7 49	5 47	22 29	23 46	24 59	0 59
52	7 42	5 46	22 25	23 40	24 52	0 52
50	7 35	5 44	22 22	23 35	24 45	0 45
45	7 21	5 41	22 16	23 24	24 30	0 30
40	7 10	5 37	22 11	23 16	24 18	0 18
35	7 00	5 33	22 06	23 08	24 08	0 08
30	6 51	5 29	22 02	23 01	23 59	24 56
20	6 36	5 20	21 55	22 50	23 44	24 37
10	6 23	5 10	21 49	22 40	23 31	24 22
0	6 10	4 58	21 43	22 31	23 19	24 07
10	5 57	4 43	21 38	22 22	23 06	23 52
20	5 44	4 24	21 32	22 12	22 53	23 36
30	5 28	3 58	21 25	22 01	22 39	23 18
35	5 18	3 41	21 21	21 55	22 30	23 08
40	5 08	3 20	21 17	21 48	22 20	22 56
45	4 55	2 50	21 12	21 40	22 09	22 42
50	4 40	2 06	21 06	21 30	21 56	22 25
52	4 33	1 40	21 04	21 25	21 49	22 17
54	4 25	0 54	21 01	21 20	21 42	22 09
56	4 16	////	20 57	21 15	21 34	21 59
58	4 06	////	20 54	21 08	21 26	21 47
60	3 54	////	20 50	21 01	21 16	21 34

Lat. N °	Sunset h m	Twlt. ends h m	Moonset 31 h m	1 h m	2 h m	3 h m
72	13 53	18 35	8 15	7 54	7 26	6 30
70	14 38	18 36	8 21	8 09	7 54	7 31
68	15 07	18 36	8 27	8 21	8 14	8 07
66	15 28	18 36	8 32	8 31	8 31	8 32
64	15 46	18 38	8 36	8 39	8 45	8 52
62	16 00	18 38	8 39	8 47	8 56	9 09
60	16 12	18 39	8 42	8 53	9 06	9 22
58	16 22	18 40	8 45	8 59	9 14	9 34
56	16 31	18 41	8 47	9 04	9 22	9 44
54	16 39	18 42	8 49	9 08	9 29	9 53
52	16 46	18 43	8 51	9 12	9 35	10 01
50	16 53	18 45	8 53	9 16	9 41	10 08
45	17 06	18 47	8 57	9 24	9 53	10 24
40	17 18	18 51	9 01	9 31	10 03	10 37
35	17 28	18 55	9 04	9 37	10 11	10 48
30	17 36	18 58	9 06	9 42	10 19	10 57
20	17 51	19 07	9 11	9 51	10 32	11 14
10	18 05	19 18	9 15	9 59	10 43	11 28
0	18 17	19 29	9 18	10 06	10 54	11 42
10	18 30	19 44	9 22	10 14	11 05	11 55
20	18 43	20 02	9 26	10 22	11 16	12 10
30	18 59	20 28	9 30	10 31	11 29	12 27
35	19 08	20 44	9 33	10 36	11 37	12 36
40	19 18	21 05	9 36	10 42	11 46	12 48
45	19 31	21 34	9 39	10 49	11 56	13 01
50	19 46	22 16	9 43	10 57	12 09	13 17
52	19 53	22 42	9 45	11 01	12 15	13 24
54	20 01	23 23	9 47	11 06	12 21	13 33
56	20 10	////	9 50	11 10	12 28	13 42
58	20 20	////	9 52	11 16	12 36	13 53
60	20 32	////	9 55	11 22	12 46	14 06

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
31	3 07	14 35	8 01	1 28	7 21
1	3 55	14 36	8 00	1 23	7 17
2	4 42	14 36	7 59	1 19	7 14
3	5 30	14 37	7 58	1 14	7 10

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.6	0.1	0.1
30	0.6	0.1	0.1
45	0.6	0.1	0.0
60	0.6	0.0	0.0
75	0.6	0.0	0.0
90			

Moon's Lower Limb Add

Alt. °	31 ′	1 ′	2 ′
0	16.8	15.7	14.5
4	16.8	15.7	14.5
8	16.8	15.7	14.5
12	16.8	15.7	14.6
16	16.8	15.7	14.6
20	16.8	15.7	14.6
24	16.7	15.7	14.6
28	16.7	15.7	14.6
32	16.7	15.7	14.7
36	16.6	15.7	14.7
40	16.6	15.7	14.7
44	16.5	15.6	14.8
48	16.5	15.6	14.8
52	16.4	15.6	14.9
56	16.4	15.6	14.9
60	16.3	15.6	15.0
64	16.2	15.6	15.0
68	16.2	15.6	15.1
72	16.1	15.6	15.1
76	16.0	15.6	15.2
80	16.0	15.6	15.2
84	15.9	15.6	15.3
88	15.8	15.6	15.3
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt. °	31 ′	1 ′	2 ′
0	14.8	15.5	16.1
4	14.8	15.5	16.1
8	14.8	15.5	16.1
12	14.9	15.5	16.1
16	14.9	15.5	16.1
20	14.9	15.5	16.1
24	14.9	15.5	16.1
28	15.0	15.5	16.0
32	15.0	15.5	16.0
36	15.0	15.5	16.0
40	15.1	15.5	15.9
44	15.1	15.5	15.9
48	15.2	15.5	15.8
52	15.2	15.5	15.8
56	15.3	15.5	15.8
60	15.4	15.5	15.7
64	15.4	15.5	15.7
68	15.5	15.5	15.6
72	15.5	15.6	15.6
76	15.6	15.6	15.5
80	15.7	15.6	15.4
84	15.8	15.6	15.4
88	15.8	15.6	15.3
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.5 GHA	VENUS −3.5 Dec	MARS 1.5 GHA	MARS 1.5 Dec.	JUPITER −2.1 GHA	JUPITER −2.1 Dec.	SATURN 0.7 GHA	SATURN 0.7 Dec	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
3 00	132 09.6	140 56.9	− 4 56.8	240 30.5	−22 07.0	341 20.8	+13 09.0	252 14.1	−18 29.7	280 07.2	120	−16 27.7	− 85
01	147 12.1	155 56.6	55.5	255 31.2	07.3	356 23.5	09.1	267 16.4	29.7	294 38.2	121	16 36.2	− 84
02	162 14.5	170 56.3	54.2	270 32.0	07.5	11 26.3	09.2	282 18.7	29.7	309 09.3	120	16 44.6	− 83
03	177 17.0	185 56.0	·· 52.9	285 32.7	·· 07.7	26 29.0	·· 09.3	297 21.0	·· 29.7	323 40.3	120	·16 52.9	− 83
04	192 19.4	200 55.7	51.7	300 33.4	08.0	41 31.8	09.4	312 23.3	29.8	338 11.3	121	17 01.2	− 81
05	207 21.9	215 55.5	50.4	315 34.1	08.2	56 34.6	09.6	327 25.6	29.8	352 42.4	120	17 09.3	− 80
06	222 24.4	230 55.2	− 4 49.1	330 34.8	−22 08.4	71 37.3	+13 09.7	342 27.9	−18 29.8	7 13.4	120	−17 17.3	− 80
07	237 26.8	245 54.9	47.8	345 35.5	08.7	86 40.1	09.8	357 30.2	29.8	21 44.4	119	17 25.3	− 79
08	252 29.3	260 54.6	46.5	0 36.2	08.9	101 42.8	09.9	12 32.5	29.9	36 15.3	120	17 33.2	− 77
09	267 31.8	275 54.3	·· 45.2	15 36.9	·· 09.2	116 45.6	·· 10.0	27 34.8	·· 29.9	50 46.3	120	·17 40.9	− 77
10	282 34.2	290 54.1	43.9	30 37.6	09.4	131 48.4	10.1	42 37.1	29.9	65 17.3	119	17 48.6	− 76
11	297 36.7	305 53.8	42.6	45 38.4	09.6	146 51.1	10.2	57 39.4	29.9	79 48.2	119	17 56.2	− 75
12	312 39.2	320 53.5	− 4 41.3	60 39.1	−22 09.9	161 53.9	+13 10.4	72 41.7	−18 30.0	94 19.1	120	−18 03.7	− 74
13	327 41.6	335 53.2	40.0	75 39.8	10.1	176 56.6	10.5	87 44.0	30.0	108 50.1	119	18 11.1	− 73
14	342 44.1	350 53.0	38.7	90 40.5	10.3	191 59.4	10.6	102 46.4	30.0	123 21.0	119	18 18.4	− 72
15	357 46.6	5 52.7	·· 37.5	105 41.2	·· 10.5	207 02.2	·· 10.7	117 48.7	·· 30.0	137 51.9	118	·18 25.6	− 72
16	12 49.0	20 52.4	36.2	120 41.9	10.8	222 04.9	10.8	132 51.0	30.1	152 22.7	119	18 32.8	− 70
17	27 51.5	35 52.1	34.9	135 42.6	11.0	237 07.7	10.9	147 53.3	30.1	166 53.6	119	18 39.8	− 69
18	42 53.9	50 51.8	− 4 33.6	150 43.3	−22 11.2	252 10.4	+13 11.0	162 55.6	−18 30.1	181 24.5	118	−18 46.7	− 69
19	57 56.4	65 51.6	32.3	165 44.0	11.5	267 13.2	11.2	177 57.9	30.1	195 55.3	118	18 53.6	− 67
20	72 58.9	80 51.3	31.0	180 44.7	11.7	282 16.0	11.3	193 00.2	30.2	210 26.1	119	19 00.3	− 67
21	88 01.3	95 51.0	·· 29.7	195 45.4	·· 11.9	297 18.7	·· 11.4	208 02.5	·· 30.2	224 57.0	118	·19 07.0	− 65
22	103 03.8	110 50.7	28.4	210 46.2	12.2	312 21.5	11.5	223 04.8	30.2	239 27.8	118	19 13.5	− 65
23	118 06.3	125 50.5	27.1	225 46.9	12.4	327 24.3	11.6	238 07.1	30.2	253 58.6	117	19 20.0	− 63
4 00	133 08.7	140 50.2	− 4 25.8	240 47.6	−22 12.6	342 27.0	+13 11.7	253 09.4	−18 30.3	268 29.3	118	−19 26.3	− 63
01	148 11.2	155 49.9	24.5	255 48.3	12.9	357 29.8	11.8	268 11.7	30.3	283 00.1	118	19 32.6	− 62
02	163 13.7	170 49.6	23.2	270 49.0	13.1	12 32.5	12.0	283 14.0	30.3	297 30.9	117	19 38.8	− 60
03	178 16.1	185 49.4	·· 21.9	285 49.7	·· 13.3	27 35.3	·· 12.1	298 16.3	·· 30.3	312 01.6	117	·19 44.8	− 60
04	193 18.6	200 49.1	20.6	300 50.4	13.5	42 38.1	12.2	313 18.6	30.3	326 32.3	117	19 50.8	− 59
05	208 21.1	215 48.8	19.4	315 51.1	13.8	57 40.8	12.3	328 21.0	30.4	341 03.0	117	19 56.7	− 57
06	223 23.5	230 48.6	− 4 18.1	330 51.8	−22 14.0	72 43.6	+13 12.4	343 23.3	−18 30.4	355 33.7	117	−20 02.4	− 57
07	238 26.0	245 48.3	16.8	345 52.5	14.2	87 46.4	12.5	358 25.6	30.4	10 04.4	117	20 08.1	− 56
08	253 28.4	260 48.0	15.5	0 53.2	14.4	102 49.1	12.6	13 27.9	30.4	24 35.1	117	20 13.7	− 55
09	268 30.9	275 47.7	·· 14.2	15 53.9	·· 14.7	117 51.9	·· 12.8	28 30.2	·· 30.5	39 05.8	116	·20 19.2	− 53
10	283 33.4	290 47.5	12.9	30 54.6	14.9	132 54.7	12.9	43 32.5	30.5	53 36.4	117	20 24.5	− 53
11	298 35.8	305 47.2	11.6	45 55.4	15.1	147 57.4	13.0	58 34.8	30.5	68 07.1	116	20 29.8	− 52
12	313 38.3	320 46.9	− 4 10.3	60 56.1	−22 15.4	163 00.2	+13 13.1	73 37.1	−18 30.5	82 37.7	116	−20 35.0	− 50
13	328 40.8	335 46.7	09.0	75 56.8	15.6	178 02.9	13.2	88 39.4	30.6	97 08.3	116	20 40.0	− 50
14	343 43.2	350 46.4	07.7	90 57.5	15.8	193 05.7	13.3	103 41.7	30.6	111 38.9	116	20 45.0	− 49
15	358 45.7	5 46.1	·· 06.4	105 58.2	·· 16.0	208 08.5	·· 13.4	118 44.0	·· 30.6	126 09.5	116	·20 49.9	− 47
16	13 48.2	20 45.8	05.1	120 58.9	16.3	223 11.2	13.6	133 46.4	30.6	140 40.1	115	20 54.6	− 47
17	28 50.6	35 45.6	03.8	135 59.6	16.5	238 14.0	13.7	148 48.7	30.7	155 10.6	116	20 59.3	− 46
18	43 53.1	50 45.3	− 4 02.5	151 00.3	−22 16.7	253 16.8	+13 13.8	163 51.0	−18 30.7	169 41.2	116	−21 03.9	− 44
19	58 55.5	65 45.0	4 01.2	166 01.0	16.9	268 19.5	13.9	178 53.3	30.7	184 11.8	115	21 08.3	− 44
20	73 58.0	80 44.8	3 59.9	181 01.7	17.2	283 22.3	14.0	193 55.6	30.7	198 42.3	115	21 12.7	− 42
21	89 00.5	95 44.5	·· 58.6	196 02.4	·· 17.4	298 25.1	·· 14.1	208 57.9	·· 30.7	213 12.8	115	·21 16.9	− 42
22	104 02.9	110 44.2	57.3	211 03.1	17.6	313 27.8	14.2	224 00.2	30.8	227 43.3	115	21 21.1	− 40
23	119 05.4	125 44.0	56.0	226 03.8	17.8	328 30.6	14.4	239 02.5	30.8	242 13.8	115	21 25.1	− 40
5 00	134 07.9	140 43.7	− 3 54.7	241 04.5	−22 18.0	343 33.4	+13 14.5	254 04.8	−18 30.8	256 44.3	115	−21 29.1	− 38
01	149 10.3	155 43.4	53.4	256 05.2	18.3	358 36.1	14.6	269 07.1	30.8	271 14.8	115	21 32.9	− 38
02	164 12.8	170 43.2	52.1	271 06.0	18.5	13 38.9	14.7	284 09.5	30.9	285 45.3	115	21 36.7	− 36
03	179 15.3	185 42.9	·· 50.8	286 06.7	·· 18.7	28 41.7	·· 14.8	299 11.8	·· 30.9	300 15.8	115	·21 40.3	− 35
04	194 17.7	200 42.6	49.5	301 07.4	18.9	43 44.4	14.9	314 14.1	30.9	314 46.3	114	21 43.8	− 35
05	209 20.2	215 42.4	48.2	316 08.1	19.1	58 47.2	15.1	329 16.4	30.9	329 16.7	115	21 47.3	− 33
06	224 22.7	230 42.1	− 3 46.9	331 08.8	−22 19.4	73 50.0	+13 15.2	344 18.7	−18 31.0	343 47.2	114	−21 50.6	− 32
07	239 25.1	245 41.8	45.6	346 09.5	19.6	88 52.7	15.3	359 21.0	31.0	358 17.6	114	21 53.8	− 31
08	254 27.6	260 41.6	44.3	1 10.2	19.8	103 55.5	15.4	14 23.3	31.0	12 48.0	115	21 56.9	− 30
09	269 30.0	275 41.3	·· 43.0	16 10.9	·· 20.0	118 58.3	·· 15.5	29 25.6	·· 31.0	27 18.5	114	·21 59.9	− 29
10	284 32.5	290 41.0	41.7	31 11.6	20.2	134 01.0	15.6	44 28.0	31.0	41 48.9	114	22 02.8	− 28
11	299 35.0	305 40.8	40.4	46 12.3	20.5	149 03.8	15.7	59 30.3	31.1	56 19.3	114	22 05.6	− 27
12	314 37.4	320 40.5	− 3 39.1	61 13.0	−22 20.7	164 06.6	+13 15.9	74 32.6	−18 31.1	70 49.7	114	−22 08.3	− 26
13	329 39.9	335 40.3	37.8	76 13.7	20.9	179 09.3	16.0	89 34.9	31.1	85 20.1	114	22 10.9	− 25
14	344 42.4	350 40.0	36.5	91 14.4	21.1	194 12.1	16.1	104 37.2	31.1	99 50.5	114	22 13.4	− 23
15	359 44.8	5 39.7	·· 35.2	106 15.1	·· 21.3	209 14.9	·· 16.2	119 39.5	·· 31.2	114 20.9	114	·22 15.7	− 23
16	14 47.3	20 39.5	33.9	121 15.8	21.6	224 17.6	16.3	134 41.8	31.2	128 51.3	114	22 18.0	− 22
17	29 49.8	35 39.2	32.6	136 16.5	21.8	239 20.4	16.4	149 44.1	31.2	143 21.7	114	22 20.2	− 20
18	44 52.2	50 38.9	− 3 31.3	151 17.2	−22 22.0	254 23.2	+13 16.6	164 46.5	−18 31.2	157 52.1	114	−22 22.2	− 20
19	59 54.7	65 38.7	30.0	166 17.9	22.2	269 25.9	16.7	179 48.8	31.2	172 22.5	114	22 24.2	− 18
20	74 57.2	80 38.4	28.7	181 18.6	22.4	284 28.7	16.8	194 51.1	31.3	186 52.9	114	22 26.0	− 18
21	89 59.6	95 38.2	·· 27.4	196 19.3	·· 22.6	299 31.5	·· 16.9	209 53.4	·· 31.3	201 23.3	113	·22 27.8	− 16
22	105 02.1	110 37.9	26.1	211 20.1	22.9	314 34.2	17.0	224 55.7	31.3	215 53.6	114	22 29.4	− 15
23	120 04.5	125 37.6	24.8	226 20.8	23.1	329 37.0	17.1	239 58.0	31.3	230 24.0	114	22 30.9	− 14
24	135 07.0	140 37.4	− 3 23.5	241 21.5	−22 23.3	344 39.8	+13 17.2	255 00.3	−18 31.4	244 54.4	114	−22 32.3	− 14
code	—	− 2	+ 13	+ 7	− 2	+ 27	+ 1	+ 23	− 1				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
3 00	176 33.6	−16 52.7	7	Acamar	315 50.9	−40 29.0
01	191 33.6	52.0	5	Achernar	335 58.8	−57 27.8
02	206 33.5	51.3	30	Acrux	173 57.0	−62 51.3
03	221 33.4	50.6	19	Adhara	255 46.0	−28 54.9
04	236 33.3	49.9	10	Aldebaran	291 38.6	+16 25.4
05	251 33.3	49.1				
06	266 33.2	−16 48.4	32	Alioth	166 58.0	+56 11.5
07	281 33.1	47.7	34	Alkaid	153 32.5	+49 31.5
08	296 33.0	47.0	55	Al Na'ir	28 38.0	−47 10.5
09	311 33.0	46.2	15	Alnilam	276 29.8	− 1 13.8
10	326 32.9	45.5	25	Alphard	218 38.0	− 8 28.3
11	341 32.8	44.8				
12	356 32.7	−16 44.1	41	Alphecca	126 47.4	+26 51.4
13	11 32.7	43.3	1	Alpheratz	358 28.3	+28 51.0
14	26 32.6	42.6	51	Altair	62 50.4	+ 8 45.0
15	41 32.5	41.9	2	Ankaa	353 58.3	−42 32.8
16	56 32.5	41.1	42	Antares	113 19.1	−26 20.1
17	71 32.4	40.4				
18	86 32.3	−16 39.7	37	Arcturus	146 34.8	+19 24.3
19	101 32.2	39.0	43	Atria	108 59.9	−68 56.8
20	116 32.2	38.2	22	Avior	234 35.0	−59 22.2
21	131 32.1	37.5	13	Bellatrix	279 17.9	+ 6 18.6
22	146 32.0	36.8	16	Betelg'se	271 47.6	+ 7 23.9
23	161 32.0	36.0				
			17	Canopus	264 14.8	−52 40.5
4 00	176 31.9	−16 35.3	12	Capella	281 37.7	+45 57.4
01	191 31.8	34.6	53	Deneb	50 01.2	+45 07.4
02	206 31.8	33.8	28	Denebola	183 17.2	+14 48.8
03	221 31.7	33.1	4	Diphda	349 39.1	−18 13.7
04	236 31.6	32.4				
05	251 31.6	31.6	27	Dubhe	194 43.6	+61 59.0
06	266 31.5	−16 30.9	14	Elnath	279 06.7	+28 34.4
07	281 31.4	30.1	47	Eltanin	91 06.5	+51 29.4
08	296 31.4	29.4	54	Enif	34 29.6	+ 9 40.4
09	311 31.3	28.7	56	Fomalhaut	16 11.6	−29 51.4
10	326 31.2	27.9				
11	341 31.2	27.2	31	Gacrux	172 48.5	−56 52.0
12	356 31.1	−16 26.5	29	Gienah	176 36.3	−17 18.0
13	11 31.0	25.7	35	Hadar	149 48.8	−60 09.6
14	26 31.0	25.0	6	Hamal	328 49.4	+23 15.5
15	41 30.9	24.2	48	Kaus Aust.	84 41.1	−34 24.4
16	56 30.8	23.5				
17	71 30.8	22.8	40	Kochab	137 18.0	+74 19.7
18	86 30.7	−16 22.0	57	Markab	14 21.4	+14 58.2
19	101 30.7	21.3	8	Menkar	315 00.0	+ 3 55.1
20	116 30.6	20.5	36	Menkent	148 58.2	−36 09.3
21	131 30.5	19.8	24	Miapl'dus	221 48.0	−69 32.3
22	146 30.5	19.0				
23	161 30.4	18.3	9	Mirfak	309 41.9	+49 42.6
			50	Nunki	76 51.8	−26 21.1
5 00	176 30.4	−16 17.6	52	Peacock	54 27.4	−56 52.6
01	191 30.3	16.8	21	Pollux	244 19.9	+28 07.9
02	206 30.2	16.1	20	Procyon	245 44.4	+ 5 20.2
03	221 30.2	15.3				
04	236 30.1	14.6	46	R'alhague	96 46.6	+12 35.3
05	251 30.1	13.8	26	Regulus	208 28.9	+12 10.7
06	266 30.0	−16 13.1	11	Rigel	281 53.2	− 8 15.2
07	281 29.9	12.3	38	Rigil Kent.	140 50.5	−60 39.2
08	296 29.9	11.6	44	Sabik	103 02.0	−15 40.3
09	311 29.8	10.8				
10	326 29.8	10.1	3	Schedar	350 29.9	+56 18.1
11	341 29.7	09.3	45	Shaula	97 20.5	−37 04.3
12	356 29.7	−16 08.6	18	Sirius	259 11.3	−16 39.5
13	11 29.6	07.8	33	Spica	159 16.4	−10 56.1
14	26 29.5	07.1	23	Suhail	223 23.6	−43 15.4
15	41 29.5	06.3				
16	56 29.4	05.6	49	Vega	81 08.4	+38 44.4
17	71 29.4	04.8	39	Zub'g'bi	137 53.0	−15 51.7
18	86 29.3	−16 04.1				
19	101 29.3	03.3				
20	116 29.2	02.5				
21	131 29.2	01.8				
22	146 29.1	01.0				
23	161 29.1	16 00.3				
24	176 29.0	−15 59.5				
code	—	+ 8				

Lat. N °	Sunrise h m	Twlt. begins h m
72	10 11	5 46
70	9 34	5 47
68	9 09	5 47
66	8 49	5 47
64	8 33	5 46
62	8 20	5 46
60	8 09	5 46
58	7 59	5 45
56	7 51	5 44
54	7 44	5 43
52	7 37	5 41
50	7 31	5 41
45	7 18	5 38
40	7 07	5 35
35	6 57	5 31
30	6 49	5 28
20	6 35	5 20
10	6 22	5 10
0	6 10	4 58
10	5 58	4 44
20	5 45	4 26
30	5 31	4 02
35	5 22	3 45
40	5 12	3 25
45	5 00	2 58
50	4 45	2 18
52	4 39	1 54
54	4 31	1 19
56	4 23	////
58	4 13	////
60	4 02	////
S		

Moonrise	3	4	5	6
	h m	h m	h m	h m
72	4 15	▬	▬	▬
70	3 15	▬	▬	▬
68	2 40	4 32	▬	▬
66	2 16	3 52	5 22	6 35
64	1 57	3 24	4 44	5 49
62	1 41	3 03	4 17	5 19
60	1 28	2 46	3 57	4 56
58	1 17	2 32	3 40	4 38
56	1 08	2 20	3 25	4 23
54	0 59	2 09	3 13	4 09
52	0 52	2 00	3 02	3 58
50	0 45	1 51	2 52	3 48
45	0 30	1 33	2 32	3 26
40	0 18	1 19	2 16	3 09
35	0 08	1 06	2 02	2 54
30	24 56	0 56	1 50	2 42
20	24 37	0 37	1 30	2 20
10	24 22	0 22	1 12	2 02
0	24 07	0 07	0 55	1 44
10	23 52	24 39	0 39	1 27
20	23 36	24 21	0 21	1 08
30	23 18	24 01	0 01	0 47
35	23 08	23 49	24 34	0 34
40	22 56	23 36	24 20	0 20
45	22 42	23 20	24 03	0 03
50	22 25	23 00	23 42	24 31
52	22 17	22 51	23 32	24 21
54	22 09	22 41	23 21	24 09
56	21 59	22 29	23 08	23 56
58	21 47	22 15	22 53	23 41
60	21 34	22 00	22 35	23 23

Lat. N °	Sunset h m	Twlt. ends h m
72	14 18	18 46
70	14 55	18 45
68	15 20	18 44
66	15 40	18 45
64	15 56	18 45
62	16 09	18 45
60	16 20	18 46
58	16 29	18 46
56	16 38	18 47
54	16 45	18 47
52	16 52	18 48
50	16 58	18 49
45	17 11	18 52
40	17 22	18 55
35	17 31	18 57
30	17 39	19 01
20	17 53	19 08
10	18 06	19 18
0	18 17	19 29
10	18 29	19 43
20	18 42	20 01
30	18 57	20 25
35	19 06	20 41
40	19 16	21 01
45	19 27	21 27
50	19 41	22 06
52	19 48	22 29
54	19 55	23 00
56	20 04	////
58	20 13	////
60	20 24	////

Moonset	3	4	5	6
	h m	h m	h m	h m
72	6 30	▬	▬	▬
70	7 31	▬	▬	▬
68	8 07	7 56	▬	▬
66	8 32	8 37	8 48	9 17
64	8 52	9 05	9 26	10 03
62	9 09	9 26	9 53	10 33
60	9 22	9 44	10 14	10 55
58	9 34	9 58	10 31	11 14
56	9 44	10 11	10 45	11 29
54	9 53	10 22	10 58	11 42
52	10 01	10 32	11 09	11 54
50	10 08	10 41	11 19	12 04
45	10 24	10 59	11 39	12 25
40	10 37	11 14	11 56	12 43
35	10 48	11 27	12 10	12 57
30	10 57	11 38	12 23	13 10
20	11 14	11 58	12 44	13 32
10	11 28	12 14	13 02	13 50
0	11 42	12 30	13 19	14 08
10	11 55	12 46	13 36	14 25
20	12 10	13 03	13 54	14 44
30	12 27	13 22	14 15	15 06
35	12 36	13 33	14 28	15 18
40	12 48	13 47	14 42	15 33
45	13 01	14 02	14 59	15 50
50	13 17	14 21	15 19	16 11
52	13 24	14 30	15 29	16 21
54	13 33	14 40	15 41	16 33
56	13 42	14 52	15 53	16 46
58	13 53	15 05	16 08	17 01
60	14 06	15 20	16 26	17 19

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.6	0.1	0.1
30	0.6	0.1	0.1
45	0.6	0.1	0.0
60	0.6	0.0	0.0
75	0.6	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	3	4	5
°	′	′	′
0	13.5	12.9	12.2
4	13.5	12.9	12.3
8	13.5	12.9	12.3
12	13.6	12.9	12.3
16	13.6	13.0	12.4
20	13.6	13.0	12.4
24	13.7	13.1	12.5
28	13.7	13.2	12.6
32	13.8	13.2	12.7
36	13.9	13.3	12.8
40	13.9	13.4	12.9
44	14.0	13.5	13.0
48	14.1	13.6	13.2
52	14.2	13.7	13.3
56	14.3	13.9	13.5
60	14.4	14.0	13.6
64	14.5	14.1	13.8
68	14.6	14.3	14.0
72	14.7	14.4	14.1
76	14.8	14.5	14.3
80	14.9	14.7	14.5
84	15.0	14.8	14.7
88	15.1	14.9	14.8
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	3	4	5
°	′	′	′
0	16.7	17.1	17.4
4	16.7	17.1	17.4
8	16.7	17.0	17.4
12	16.7	17.0	17.4
16	16.6	17.0	17.3
20	16.6	16.9	17.3
24	16.6	16.9	17.2
28	16.5	16.8	17.1
32	16.4	16.7	17.0
36	16.4	16.6	16.9
40	16.3	16.5	16.8
44	16.2	16.4	16.6
48	16.1	16.3	16.5
52	16.1	16.2	16.4
56	16.0	16.1	16.2
60	15.9	16.0	16.1
64	15.8	15.8	15.9
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.3	15.3	15.2
84	15.2	15.1	15.0
88	15.1	15.0	14.9
90			

Subtract from table, back cover

GMT	Equation of Time (App.—Mean) 3	4	5
h	m s	m s	m s
0	−13 45.3	−13 52.3	−13 58.5
6	−13 47.1	−13 53.9	−13 59.9
12	−13 48.9	−13 55.5	−14 01.3
18	−13 50.6	−13 57.0	−14 02.6
24	−13 52.3	−13 58.5	−14 03.9

GMT of Transit Meridian of Greenwich	DAY	Moon	Venus	Mars	Jupiter	Saturn
		h m	h m	h m	h m	h m
	3	5 30	14 37	7 58	1 14	7 10
	4	6 18	14 37	7 56	1 10	7 06
	5	7 07	14 37	7 55	1 06	7 03
	6	7 56	14 38	7 54	1 01	6 59

GMT	♈ GHA	VENUS −3.5 GHA	VENUS −3.5 Dec.	MARS 1.4 GHA	MARS 1.4 Dec.	JUPITER −2.1 GHA	JUPITER −2.1 Dec.	SATURN 0.7 GHA	SATURN 0.7 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
6 00	135 07.0	140 37.4	− 3 23.5	241 21.5	−22 23.3	344 39.8	+13 17.2	255 00.3	−18 31.4	244 54.4	114	−22 32.3	− 14
01	150 09.5	155 37.1	22.2	256 22.2	23.5	359 42.5	17.4	270 02.7	31.4	259 24.8	114	22 33.7	− 12
02	165 11.9	170 36.9	20.9	271 22.9	23.7	14 45.3	17.5	285 05.0	31.4	273 55.2	113	22 34.9	− 11
03	180 14.4	185 36.6	·· 19.6	286 23.6	·· 23.9	29 48.1	·· 17.6	300 07.3	·· 31.4	288 25.5	114	·22 36.0	− 10
04	195 16.9	200 36.3	18.3	301 24.3	24.1	44 50.8	17.7	315 09.6	31.4	302 55.9	114	22 37.0	− 9
05	210 19.3	215 36.1	17.0	316 25.0	24.4	59 53.6	17.8	330 11.9	31.5	317 26.3	114	22 37.9	− 7
06	225 21.8	230 35.8	− 3 15.7	331 25.7	−22 24.6	74 56.4	+13 17.9	345 14.2	−18 31.5	331 56.7	114	−22 38.6	− 7
07	240 24.3	245 35.6	14.4	346 26.4	24.8	89 59.2	18.1	0 16.6	31.5	346 27.1	114	22 39.3	− 6
08	255 26.7	260 35.3	13.1	1 27.1	25.0	105 01.9	18.2	15 18.9	31.5	0 57.5	114	22 39.9	− 4
09	270 29.2	275 35.0	·· 11.8	16 27.8	·· 25.2	120 04.7	·· 18.3	30 21.2	·· 31.6	15 27.9	114	·22 40.3	− 4
10	285 31.6	290 34.8	10.5	31 28.5	25.4	135 07.5	18.4	45 23.5	31.6	29 58.3	114	22 40.7	− 3
11	300 34.1	305 34.5	09.2	46 29.2	25.6	150 10.2	18.5	60 25.8	31.6	44 28.7	114	22 41.0	− 1
12	315 36.6	320 34.3	− 3 07.9	61 29.9	−22 25.8	165 13.0	+13 18.6	75 28.1	−18 31.6	58 59.1	114	−22 41.1	0
13	330 39.0	335 34.0	06.6	76 30.6	26.0	180 15.8	18.8	90 30.5	31.6	73 29.5	114	22 41.1	0
14	345 41.5	350 33.8	05.3	91 31.3	26.3	195 18.5	18.9	105 32.8	31.7	87 59.9	114	22 41.1	+ 2
15	0 44.0	5 33.5	·· 04.0	106 32.0	·· 26.5	210 21.3	·· 19.0	120 35.1	·· 31.7	102 30.3	115	·22 40.9	+ 3
16	15 46.4	20 33.2	02.7	121 32.7	26.7	225 24.1	19.1	135 37.4	31.7	117 00.8	114	22 40.6	+ 4
17	30 48.9	35 33.0	01.4	136 33.4	26.9	240 26.8	19.2	150 39.7	31.7	131 31.2	115	22 40.2	+ 5
18	45 51.4	50 32.7	− 3 00.1	151 34.1	−22 27.1	255 29.6	+13 19.3	165 42.0	−18 31.7	146 01.7	114	−22 39.7	+ 6
19	60 53.8	65 32.5	2 58.8	166 34.8	27.3	270 32.4	19.4	180 44.4	31.8	160 32.1	115	22 39.1	+ 7
20	75 56.3	80 32.2	57.5	181 35.5	27.5	285 35.2	19.6	195 46.7	31.8	175 02.6	115	22 38.4	+ 8
21	90 58.8	95 32.0	·· 56.2	196 36.2	·· 27.7	300 37.9	·· 19.7	210 49.0	·· 31.8	189 33.1	115	·22 37.6	+ 9
22	106 01.2	110 31.7	54.9	211 36.9	27.9	315 40.7	19.8	225 51.3	31.8	204 03.6	115	22 36.7	+ 10
23	121 03.7	125 31.5	53.6	226 37.6	28.1	330 43.5	19.9	240 53.6	31.9	218 34.1	115	22 35.7	+ 11
7 00	136 06.1	140 31.2	− 2 52.3	241 38.3	−22 28.4	345 46.2	+13 20.0	255 55.9	−18 31.9	233 04.6	115	−22 34.6	+ 12
01	151 08.6	155 30.9	51.0	256 39.0	28.6	0 49.0	20.1	270 58.3	31.9	247 35.1	116	22 33.4	+ 14
02	166 11.1	170 30.7	49.6	271 39.7	28.8	15 51.8	20.3	286 00.6	31.9	262 05.7	115	22 32.0	+ 14
03	181 13.5	185 30.4	·· 48.3	286 40.4	·· 29.0	30 54.6	·· 20.4	301 02.9	·· 31.9	276 36.2	116	·22 30.6	+ 16
04	196 16.0	200 30.2	47.0	301 41.1	29.2	45 57.3	20.5	316 05.2	32.0	291 06.8	115	22 29.0	+ 16
05	211 18.5	215 29.9	45.7	316 41.8	29.4	61 00.1	20.6	331 07.5	32.0	305 37.3	116	22 27.4	+ 17
06	226 20.9	230 29.7	− 2 44.4	331 42.5	−22 29.6	76 02.9	+13 20.7	346 09.9	−18 32.0	320 07.9	116	−22 25.7	+ 19
07	241 23.4	245 29.4	43.1	346 43.2	29.8	91 05.6	20.8	1 12.2	32.0	334 38.5	117	22 23.8	+ 20
08	256 25.9	260 29.2	41.8	1 43.9	30.0	106 08.4	21.0	16 14.5	32.0	349 09.2	116	22 21.8	+ 20
09	271 28.3	275 28.9	·· 40.5	16 44.6	·· 30.2	121 11.2	·· 21.1	31 16.8	·· 32.1	3 39.8	116	·22 19.8	+ 22
10	286 30.8	290 28.7	39.2	31 45.3	30.4	136 14.0	21.2	46 19.1	32.1	18 10.4	117	22 17.6	+ 23
11	301 33.3	305 28.4	37.9	46 46.0	30.6	151 16.7	21.3	61 21.5	32.1	32 41.1	117	22 15.3	+ 23
12	316 35.7	320 28.2	− 2 36.6	61 46.7	−22 30.8	166 19.5	+13 21.4	76 23.8	−18 32.1	47 11.8	117	−22 13.0	+ 25
13	331 38.2	335 27.9	35.3	76 47.4	31.0	181 22.3	21.5	91 26.1	32.2	61 42.5	117	22 10.5	+ 26
14	346 40.6	350 27.7	34.0	91 48.1	31.2	196 25.0	21.7	106 28.4	32.2	76 13.2	117	22 07.9	+ 26
15	1 43.1	5 27.4	·· 32.7	106 48.8	·· 31.4	211 27.8	·· 21.8	121 30.7	·· 32.2	90 43.9	118	·22 05.3	+ 28
16	16 45.6	20 27.2	31.4	121 49.5	31.6	226 30.6	21.9	136 33.1	32.2	105 14.7	118	22 02.5	+ 29
17	31 48.0	35 26.9	30.1	136 50.2	31.8	241 33.4	22.0	151 35.4	32.2	119 45.5	118	21 59.6	+ 30
18	46 50.5	50 26.7	− 2 28.8	151 50.9	−22 32.0	256 36.1	+13 22.1	166 37.7	−18 32.3	134 16.3	118	−21 56.6	+ 31
19	61 53.0	65 26.4	27.4	166 51.6	32.2	271 38.9	22.2	181 40.0	32.3	148 47.1	118	21 53.5	+ 32
20	76 55.4	80 26.2	26.1	181 52.3	32.4	286 41.7	22.4	196 42.4	32.3	163 17.9	118	21 50.3	+ 32
21	91 57.9	95 25.9	·· 24.8	196 53.0	·· 32.6	301 44.4	·· 22.5	211 44.7	·· 32.3	177 48.7	119	·21 47.1	+ 34
22	107 00.4	110 25.7	23.5	211 53.7	32.8	316 47.2	22.6	226 47.0	32.3	192 19.6	119	21 43.7	+ 35
23	122 02.8	125 25.4	22.2	226 54.4	33.0	331 50.0	22.7	241 49.3	32.4	206 50.5	119	21 40.2	+ 36
8 00	137 05.3	140 25.2	− 2 20.9	241 55.1	−22 33.2	346 52.8	+13 22.8	256 51.6	−18 32.4	221 21.4	120	−21 36.6	+ 37
01	152 07.7	155 24.9	19.6	256 55.8	33.4	1 55.5	22.9	271 54.0	32.4	235 52.4	119	21 32.9	+ 38
02	167 10.2	170 24.7	18.3	271 56.5	33.6	16 58.3	23.1	286 56.3	32.4	250 23.3	120	21 29.1	+ 38
03	182 12.7	185 24.4	·· 17.0	286 57.2	·· 33.8	32 01.1	·· 23.2	301 58.6	·· 32.4	264 54.3	120	·21 25.3	+ 40
04	197 15.1	200 24.2	15.7	301 57.9	34.0	47 03.9	23.3	317 00.9	32.5	279 25.3	120	21 21.3	+ 41
05	212 17.6	215 23.9	14.4	316 58.6	34.2	62 06.6	23.4	332 03.3	32.5	293 56.3	121	21 17.2	+ 42
06	227 20.1	230 23.7	− 2 13.1	331 59.3	−22 34.4	77 09.4	+13 23.5	347 05.6	−18 32.5	308 27.4	121	−21 13.0	+ 42
07	242 22.5	245 23.5	11.7	347 00.0	34.6	92 12.2	23.6	2 07.9	32.5	322 58.5	121	21 08.8	+ 44
08	257 25.0	260 23.2	10.4	2 00.7	34.8	107 15.0	23.8	17 10.2	32.5	337 29.6	121	21 04.4	+ 45
09	272 27.5	275 23.0	·· 09.1	17 01.4	·· 35.0	122 17.7	·· 23.9	32 12.5	·· 32.6	352 00.7	122	·20 59.9	+ 45
10	287 29.9	290 22.7	07.8	32 02.1	35.2	137 20.5	24.0	47 14.9	32.6	6 31.9	121	20 55.4	+ 47
11	302 32.4	305 22.5	06.5	47 02.8	35.4	152 23.3	24.1	62 17.2	32.6	21 03.0	122	20 50.7	+ 47
12	317 34.9	320 22.2	− 2 05.2	62 03.5	−22 35.6	167 26.1	+13 24.2	77 19.5	−18 32.6	35 34.2	123	−20 46.0	+ 49
13	332 37.3	335 22.0	03.9	77 04.2	35.8	182 28.8	24.3	92 21.8	32.6	50 05.5	122	20 41.1	+ 49
14	347 39.8	350 21.7	02.6	92 04.9	36.0	197 31.6	24.5	107 24.2	32.7	64 36.7	123	20 36.2	+ 51
15	2 42.2	5 21.5	·· 01.3	107 05.6	·· 36.2	212 34.4	·· 24.6	122 26.5	·· 32.7	79 08.0	123	·20 31.1	+ 51
16	17 44.7	20 21.2	2 00.0	122 06.3	36.4	227 37.1	24.7	137 28.8	32.7	93 39.3	123	20 26.0	+ 52
17	32 47.2	35 21.0	1 58.7	137 07.0	36.6	242 39.9	24.8	152 31.1	32.7	108 10.6	124	20 20.8	+ 53
18	47 49.6	50 20.8	− 1 57.4	152 07.7	−22 36.8	257 42.7	+13 24.9	167 33.5	−18 32.7	122 42.0	124	−20 15.5	+ 54
19	62 52.1	65 20.5	56.0	167 08.4	37.0	272 45.5	25.0	182 35.8	32.8	137 13.4	124	20 10.1	+ 55
20	77 54.6	80 20.3	54.7	182 09.1	37.2	287 48.2	25.2	197 38.1	32.8	151 44.8	124	20 04.6	+ 56
21	92 57.0	95 20.0	·· 53.4	197 09.8	·· 37.4	302 51.0	·· 25.3	212 40.4	·· 32.8	166 16.2	125	·19 59.0	+ 57
22	107 59.5	110 19.8	52.1	212 10.5	37.6	317 53.8	25.4	227 42.8	32.8	180 47.7	125	19 53.3	+ 58
23	123 02.0	125 19.5	50.8	227 11.2	37.8	332 56.6	25.5	242 45.1	32.8	195 19.2	125	19 47.5	+ 58
24	138 04.4	140 19.3	− 1 49.5	242 11.9	−22 38.0	347 59.3	+13 25.6	257 47.4	−18 32.9	209 50.7	126	−19 41.7	+ 60
code	−	− 3	+ 13	+ 7	− 2	+ 28	+ 1	+ 23	− 1				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
6 00	176 29.0	−15 59.5	7	Acamar	315 50.9	−40 29.0
01	191 29.0	58.8	5	Achernar	335 58.8	−57 27.8
02	206 28.9	58.0	30	Acrux	173 57.0	−62 51.3
03	221 28.9	·· 57.3	19	Adhara	255 46.0	−28 54.9
04	236 28.8	56.5	10	Aldebaran	291 38.6	+16 25.4
05	251 28.7	55.7				
06	266 28.7	−15 55.0	32	Alioth	166 58.0	+56 11.5
07	281 28.6	54.2	34	Alkaid	153 32.5	+49 31.5
08	296 28.6	53.5	55	Al Na'ir	28 38.0	−47 10.5
09	311 28.5	·· 52.7	15	Alnilam	276 29.8	− 1 13.8
10	326 28.5	51.9	25	Alphard	218 38.0	− 8 28.3
11	341 28.5	51.2				
12	356 28.4	−15 50.4	41	Alphecca	126 47.4	+26 51.4
13	11 28.4	49.6	1	Alpheratz	358 28.3	+28 51.0
14	26 28.3	48.9	51	Altair	62 50.4	+ 8 45.0
15	41 28.3	·· 48.1	2	Ankaa	353 58.3	−42 32.8
16	56 28.2	47.4	42	Antares	113 19.1	−26 20.1
17	71 28.2	46.6				
18	86 28.1	−15 45.8	37	Arcturus	146 34.8	+19 24.3
19	101 28.1	45.1	43	Atria	108 59.8	−68 56.8
20	116 28.0	44.3	22	Avior	234 35.0	−59 22.3
21	131 28.0	·· 43.5	13	Bellatrix	279 17.9	+ 6 18.6
22	146 27.9	42.8	16	Betelg'se	271 47.6	+ 7 23.9
23	161 27.9	42.0				
			17	Canopus	264 14.8	−52 40.5
7 00	176 27.9	−15 41.2	12	Capella	281 37.7	+45 57.4
01	191 27.8	40.5	53	Deneb	50 01.2	+45 07.4
02	206 27.8	39.7	28	Denebola	183 17.2	+14 48.8
03	221 27.7	·· 38.9	4	Diphda	349 39.1	−18 13.7
04	236 27.7	38.1				
05	251 27.6	37.4	27	Dubhe	194 43.6	+61 59.0
06	266 27.6	−15 36.6	14	Elnath	279 06.7	+28 34.4
07	281 27.6	35.8	47	Eltanin	91 06.5	+51 29.4
08	296 27.5	35.1	54	Enif	34 29.6	+ 9 40.4
09	311 27.5	·· 34.3	56	Fomalhaut	16 11.6	−29 51.4
10	326 27.4	33.5				
11	341 27.4	32.7	31	Gacrux	172 48.5	−56 52.0
12	356 27.4	−15 32.0	29	Gienah	176 36.3	−17 18.0
13	11 27.3	31.2	35	Hadar	149 48.8	−60 09.6
14	26 27.3	30.4	6	Hamal	328 49.4	+23 15.5
15	41 27.2	·· 29.6	48	Kaus Aust.	84 41.1	−34 24.4
16	56 27.2	28.9				
17	71 27.2	28.1	40	Kochab	137 17.9	+74 19.7
18	86 27.1	−15 27.3	57	Markab	14 21.4	+14 58.2
19	101 27.1	26.5	8	Menkar	315 00.0	+ 3 55.1
20	116 27.0	25.8	36	Menkent	148 58.2	−36 09.3
21	131 27.0	·· 25.0	24	Miapl'dus	221 48.0	−69 32.3
22	146 27.0	24.2				
23	161 26.9	23.4	9	Mirfak	309 41.9	+49 42.6
			50	Nunki	76 51.8	−26 21.1
8 00	176 26.9	−15 22.7	52	Peacock	54 27.4	−56 52.6
01	191 26.9	21.9	21	Pollux	244 19.9	+28 07.9
02	206 26.8	21.1	20	Procyon	245 44.4	+ 5 20.2
03	221 26.8	·· 20.3				
04	236 26.8	19.5	46	R'alhague	96 46.5	+12 35.3
05	251 26.7	18.8	26	Regulus	208 28.9	+12 10.7
06	266 26.7	−15 18.0	11	Rigel	281 53.2	− 8 15.2
07	281 26.7	17.2	38	Rigil Kent.	140 50.4	−60 39.2
08	296 26.6	16.4	44	Sabik	103 02.0	−15 40.3
09	311 26.6	·· 15.6				
10	326 26.6	14.8	3	Schedar	350 30.0	+56 18.1
11	341 26.5	14.1	45	Shaula	97 20.5	−37 04.3
12	356 26.5	−15 13.3	18	Sirius	259 11.3	−16 39.5
13	11 26.5	12.5	33	Spica	159 16.4	−10 56.1
14	26 26.4	11.7	23	Suhail	223 23.6	−43 15.4
15	41 26.4	·· 10.9				
16	56 26.4	10.1	49	Vega	81 08.4	+38 44.4
17	71 26.4	09.3	39	Zub'g'bi	137 53.0	−15 51.7
18	86 26.3	−15 08.6				
19	101 26.3	07.8				
20	116 26.3	07.0				
21	131 26.2	·· 06.2				
22	146 26.2	05.4				
23	161 26.2	04.6				
24	176 26.2	−15 03.8				
code	—	+ 8				

Lat.	Sunrise	Twlt. begins	Moonrise 6	7	8	9
N °	h m	h m	h m	h m	h m	h m
72	9 49	5 36				
70	9 18	5 38				8 56
68	8 56	5 38			8 23	8 08
66	8 38	5 39	6 35	7 15	7 32	7 38
64	8 24	5 39	5 49	6 33	6 59	7 15
62	8 12	5 40	5 19	6 05	6 36	6 56
60	8 02	5 39	4 56	5 43	6 17	6 41
58	7 53	5 39	4 38	5 25	6 01	6 28
56	7 45	5 39	4 23	5 10	5 47	6 16
54	7 38	5 38	4 09	4 57	5 36	6 07
52	7 32	5 37	3 58	4 46	5 25	5 58
50	7 26	5 37	3 48	4 36	5 16	5 50
45	7 14	5 35	3 26	4 14	4 57	5 33
40	7 04	5 33	3 09	3 57	4 41	5 19
35	6 55	5 30	2 54	3 43	4 27	5 07
30	6 47	5 27	2 42	3 30	4 15	4 57
20	6 34	5 19	2 20	3 09	3 55	4 39
10	6 22	5 10	2 02	2 50	3 38	4 23
0	6 11	5 00	1 44	2 33	3 21	4 09
10	5 59	4 46	1 27	2 16	3 05	3 54
20	5 47	4 29	1 08	1 57	2 48	3 39
30	5 33	4 05	0 47	1 36	2 27	3 21
35	5 25	3 49	0 34	1 23	2 16	3 10
40	5 15	3 30	0 20	1 09	2 02	2 58
45	5 04	3 04	0 03	0 52	1 46	2 44
50	4 50	2 27	24 31	0 31	1 26	2 26
52	4 44	2 05	24 21	0 21	1 16	2 18
54	4 37	1 37	24 09	0 09	1 06	2 09
56	4 29	0 44	23 56	24 54	0 54	1 59
58	4 20	////	23 41	24 40	0 40	1 47
60 S	4 10	////	23 23	24 24	0 24	1 33

Lat.	Sunset	Twlt. ends	Moonset 6	7	8	9
N °	h m	h m	h m	h m	h m	h m
72	14 40	18 58				
70	15 11	18 55				11 56
68	15 34	18 54			10 50	12 42
66	15 51	18 53	9 17	10 17	11 41	13 13
64	16 06	18 53	10 03	10 59	12 13	13 35
62	16 17	18 52	10 33	11 28	12 36	13 53
60	16 28	18 52	10 55	11 50	12 55	14 08
58	16 36	18 51	11 14	12 07	13 10	14 20
56	16 44	18 52	11 29	12 22	13 24	14 31
54	16 51	18 52	11 42	12 35	13 35	14 41
52	16 57	18 52	11 54	12 46	13 45	14 49
50	17 03	18 53	12 04	12 56	13 54	14 57
45	17 15	18 55	12 25	13 17	14 13	15 13
40	17 25	18 57	12 43	13 34	14 29	15 26
35	17 34	19 00	12 57	13 48	14 41	15 37
30	17 42	19 03	13 10	14 00	14 53	15 47
20	17 55	19 10	13 32	14 21	15 12	16 03
10	18 07	19 19	13 50	14 40	15 29	16 18
0	18 18	19 29	14 08	14 57	15 45	16 31
10	18 29	19 42	14 25	15 14	16 00	16 45
20	18 41	19 59	14 44	15 32	16 17	16 59
30	18 55	20 22	15 06	15 52	16 36	17 15
35	19 03	20 37	15 18	16 05	16 47	17 25
40	19 12	20 56	15 33	16 18	16 59	17 35
45	19 23	21 21	15 50	16 35	17 14	17 48
50	19 37	21 58	16 11	16 55	17 32	18 03
52	19 43	22 18	16 21	17 05	17 41	18 10
54	19 50	22 45	16 33	17 16	17 50	18 18
56	19 58	23 31	16 46	17 28	18 01	18 27
58	20 07	////	17 01	17 42	18 13	18 37
60 S	20 16	////	17 19	17 59	18 28	18 48

GMT	Equation of Time (App.—Mean) 6	7	8
h	m s	m s	m s
0	−14 03.9	−14 08.5	−14 12.3
6	−14 05.1	−14 09.5	−14 13.1
12	−14 06.3	−14 10.5	−14 13.9
18	−14 07.4	−14 11.4	−14 14.6
24	−14 08.5	−14 12.3	−14 15.3

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
6	7 56	14 38	7 54	1 01	6 59
7	8 45	14 38	7 53	0 57	6 55
8	9 33	14 39	7 52	0 52	6 52
9	10 20	14 39	7 51	0 48	6 48

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb **Add**	Venus **Add**	Mars **Add**
°	′	′	′
0	0.5	0.1	0.1
30	0.5	0.1	0.1
45	0.5	0.1	0.1
60	0.5	0.0	0.0
75	0.5	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	6	7	8
°	′	′	′
0	12.0	11.9	11.9
4	12.0	11.9	11.9
8	12.0	11.9	11.9
12	12.1	11.9	11.9
16	12.1	12.0	12.0
20	12.2	12.1	12.1
24	12.3	12.2	12.2
28	12.4	12.2	12.2
32	12.5	12.4	12.4
36	12.6	12.5	12.5
40	12.7	12.6	12.6
44	12.8	12.7	12.7
48	13.0	12.9	12.9
52	13.1	13.1	13.1
56	13.3	13.2	13.2
60	13.5	13.4	13.4
64	13.6	13.6	13.6
68	13.8	13.8	13.8
72	14.0	14.0	14.0
76	14.2	14.2	14.2
80	14.4	14.4	14.4
84	14.6	14.6	14.6
88	14.7	14.7	14.7
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	6	7	8
°	′	′	′
0	17.6	17.7	17.7
4	17.6	17.6	17.6
8	17.5	17.6	17.6
12	17.5	17.6	17.6
16	17.5	17.5	17.5
20	17.4	17.5	17.5
24	17.3	17.4	17.4
28	17.2	17.3	17.3
32	17.1	17.2	17.2
36	17.0	17.0	17.0
40	16.9	16.9	16.9
44	16.7	16.8	16.8
48	16.6	16.6	16.6
52	16.4	16.5	16.5
56	16.3	16.3	16.3
60	16.1	16.1	16.1
64	15.9	15.9	15.9
68	15.7	15.8	15.8
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.2
84	15.0	15.0	15.0
88	14.8	14.8	14.8
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS — 3.5 GHA	Dec.	MARS 1.4 GHA	Dec.	JUPITER — 2.1 GHA	Dec.	SATURN 0.7 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
9 00	138 04.4	140 19.3	− 1 49.5	242 11.9	−22 38.0	347 59.3	+13 25.6	257 47.4	−18 32.9	209 50.7	126	−19 41.7	+ 60
01	153 06.9	155 19.1	48.2	257 12.6	38.1	3 02.1	25.7	272 49.7	32.9	224 22.3	126	19 35.7	+ 60
02	168 09.4	170 18.8	46.9	272 13.3	38.3	18 04.9	25.9	287 52.1	32.9	238 53.9	126	19 29.7	+ 62
03	183 11.8	185 18.6	·· 45.6	287 14.0	·· 38.5	33 07.7	·· 26.0	302 54.4	·· 32.9	253 25.5	126	·19 23.5	+ 62
04	198 14.3	200 18.3	44.3	302 14.7	38.7	48 10.4	26.1	317 56.7	32.9	267 57.1	127	19 17.3	+ 63
05	213 16.7	215 18.1	42.9	317 15.4	38.9	63 13.2	26.2	332 59.1	33.0	282 28.8	127	19 11.0	+ 64
06	228 19.2	230 17.9	− 1 41.6	332 16.1	−22 39.1	78 16.0	+13 26.3	348 01.4	−18 33.0	297 00.5	127	−19 04.6	+ 65
07	243 21.7	245 17.6	40.3	347 16.8	39.3	93 18.8	26.4	3 03.7	33.0	311 32.2	128	18 58.1	+ 65
08	258 24.1	260 17.4	39.0	2 17.5	39.5	108 21.5	26.6	18 06.0	33.0	326 04.0	128	18 51.6	+ 67
09	273 26.6	275 17.1	·· 37.7	17 18.2	·· 39.7	123 24.3	·· 26.7	33 08.4	·· 33.0	340 35.8	128	·18 44.9	+ 67
10	288 29.1	290 16.9	36.4	32 18.9	39.9	138 27.1	26.8	48 10.7	33.1	355 07.6	128	18 38.2	+ 69
11	303 31.5	305 16.7	35.1	47 19.6	40.0	153 29.9	26.9	63 13.0	33.1	9 39.4	129	18 31.3	+ 69
12	318 34.0	320 16.4	− 1 33.8	62 20.3	−22 40.2	168 32.7	+13 27.0	78 15.4	−18 33.1	24 11.3	129	−18 24.4	+ 70
13	333 36.5	335 16.2	32.5	77 21.0	40.4	183 35.4	27.1	93 17.7	33.1	38 43.2	130	18 17.4	+ 70
14	348 38.9	350 15.9	31.1	92 21.7	40.6	198 38.2	27.3	108 20.0	33.1	53 15.2	129	18 10.4	+ 72
15	3 41.4	5 15.7	·· 29.8	107 22.4	·· 40.8	213 41.0	·· 27.4	123 22.3	·· 33.2	67 47.1	130	·18 03.2	+ 72
16	18 43.8	20 15.5	28.5	122 23.0	41.0	228 43.8	27.5	138 24.7	33.2	82 19.1	130	17 56.0	+ 73
17	33 46.3	35 15.2	27.2	137 23.7	41.2	243 46.5	27.6	153 27.0	33.2	96 51.1	131	17 48.7	+ 74
18	48 48.8	50 15.0	− 1 25.9	152 24.4	−22 41.4	258 49.3	+13 27.7	168 29.3	−18 33.2	111 23.2	131	−17 41.3	+ 75
19	63 51.2	65 14.7	24.6	167 25.1	41.6	273 52.1	27.8	183 31.7	33.2	125 55.3	131	17 33.8	+ 76
20	78 53.7	80 14.5	23.3	182 25.8	41.7	288 54.9	28.0	198 34.0	33.2	140 27.4	131	17 26.2	+ 76
21	93 56.2	95 14.3	·· 22.0	197 26.5	·· 41.9	303 57.6	·· 28.1	213 36.3	·· 33.3	154 59.5	132	·17 18.6	+ 77
22	108 58.6	110 14.0	20.7	212 27.2	42.1	319 00.4	28.2	228 38.6	33.3	169 31.7	132	17 10.9	+ 78
23	124 01.1	125 13.8	19.3	227 27.9	42.3	334 03.2	28.3	243 41.0	33.3	184 03.9	132	17 03.1	+ 79
10 00	139 03.6	140 13.6	− 1 18.0	242 28.6	−22 42.5	349 06.0	+13 28.4	258 43.3	−18 33.3	198 36.1	133	−16 55.2	+ 80
01	154 06.0	155 13.3	16.7	257 29.3	42.7	4 08.7	28.6	273 45.6	33.3	213 08.4	133	16 47.2	+ 80
02	169 08.5	170 13.1	15.4	272 30.0	42.9	19 11.5	28.7	288 48.0	33.4	227 40.7	133	16 39.2	+ 81
03	184 11.0	185 12.9	·· 14.1	287 30.7	·· 43.0	34 14.3	·· 28.8	303 50.3	·· 33.4	242 13.0	133	·16 31.1	+ 82
04	199 13.4	200 12.6	12.8	302 31.4	43.2	49 17.1	28.9	318 52.6	33.4	256 45.3	134	16 22.9	+ 82
05	214 15.9	215 12.4	11.5	317 32.1	43.4	64 19.9	29.0	333 55.0	33.4	271 17.7	134	16 14.7	+ 84
06	229 18.3	230 12.1	− 1 10.2	332 32.8	−22 43.6	79 22.6	+13 29.1	348 57.3	−18 33.4	285 50.1	134	−16 06.3	+ 84
07	244 20.8	245 11.9	08.8	347 33.5	43.8	94 25.4	29.3	3 59.6	33.5	300 22.5	135	15 57.9	+ 85
08	259 23.3	260 11.7	07.5	2 34.2	44.0	109 28.2	29.4	19 01.9	33.5	314 55.0	135	15 49.4	+ 85
09	274 25.7	275 11.4	·· 06.2	17 34.9	·· 44.1	124 31.0	·· 29.5	34 04.3	·· 33.5	329 27.5	135	·15 40.9	+ 86
10	289 28.2	290 11.2	04.9	32 35.6	44.3	139 33.7	29.6	49 06.6	33.5	344 00.0	135	15 32.3	+ 87
11	304 30.7	305 11.0	03.6	47 36.3	44.5	154 36.5	29.7	64 08.9	33.5	358 32.5	136	15 23.6	+ 88
12	319 33.1	320 10.7	− 1 02.3	62 37.0	−22 44.7	169 39.3	+13 29.8	79 11.3	−18 33.5	13 05.1	136	−15 14.8	+ 88
13	334 35.6	335 10.5	1 01.0	77 37.7	44.9	184 42.1	30.0	94 13.6	33.6	27 37.7	136	15 06.0	+ 89
14	349 38.1	350 10.3	0 59.7	92 38.3	45.0	199 44.9	30.1	109 15.9	33.6	42 10.3	137	14 57.1	+ 90
15	4 40.5	5 10.0	·· 58.3	107 39.0	·· 45.2	214 47.6	·· 30.2	124 18.3	·· 33.6	56 43.0	136	·14 48.1	+ 90
16	19 43.0	20 09.8	57.0	122 39.7	45.4	229 50.4	30.3	139 20.6	33.6	71 15.6	137	14 39.1	+ 91
17	34 45.5	35 09.6	55.7	137 40.4	45.6	244 53.2	30.4	154 22.9	33.6	85 48.3	138	14 30.0	+ 92
18	49 47.9	50 09.3	− 0 54.4	152 41.1	−22 45.8	259 56.0	+13 30.5	169 25.3	−18 33.7	100 21.1	137	−14 20.8	+ 92
19	64 50.4	65 09.1	53.1	167 41.8	45.9	274 58.7	30.7	184 27.6	33.7	114 53.8	138	14 11.6	+ 93
20	79 52.8	80 08.9	51.8	182 42.5	46.1	290 01.5	30.8	199 29.9	33.7	129 26.6	138	14 02.3	+ 94
21	94 55.3	95 08.6	·· 50.5	197 43.2	·· 46.3	305 04.3	·· 30.9	214 32.3	·· 33.7	143 59.4	138	·13 52.9	+ 94
22	109 57.8	110 08.4	49.2	212 43.9	46.5	320 07.1	31.0	229 34.6	33.7	158 32.2	139	13 43.5	+ 95
23	125 00.2	125 08.2	47.8	227 44.6	46.7	335 09.9	31.1	244 36.9	33.7	173 05.1	139	13 34.0	+ 96
11 00	140 02.7	140 07.9	− 0 46.5	242 45.3	−22 46.8	350 12.6	+13 31.2	259 39.3	−18 33.8	187 38.0	139	−13 24.4	+ 96
01	155 05.2	155 07.7	45.2	257 46.0	47.0	5 15.4	31.4	274 41.6	33.8	202 10.9	139	13 14.8	+ 96
02	170 07.6	170 07.5	43.9	272 46.7	47.2	20 18.2	31.5	289 43.9	33.8	216 43.8	139	13 05.2	+ 98
03	185 10.1	185 07.2	·· 42.6	287 47.4	·· 47.4	35 21.0	·· 31.6	304 46.3	·· 33.8	231 16.7	140	·12 55.4	+ 98
04	200 12.6	200 07.0	41.3	302 48.1	47.5	50 23.8	31.7	319 48.6	33.8	245 49.7	140	12 45.6	+ 98
05	215 15.0	215 06.8	40.0	317 48.8	47.7	65 26.5	31.8	334 50.9	33.9	260 22.7	140	12 35.8	+100
06	230 17.5	230 06.6	− 0 38.7	332 49.4	−22 47.9	80 29.3	+13 32.0	349 53.3	−18 33.9	274 55.7	141	−12 25.8	+ 99
07	245 19.9	245 06.3	37.3	347 50.1	48.1	95 32.1	32.1	4 55.6	33.9	289 28.8	140	12 15.9	+101
08	260 22.4	260 06.1	36.0	2 50.8	48.2	110 34.9	32.2	19 57.9	33.9	304 01.8	141	12 05.8	+101
09	275 24.9	275 05.9	·· 34.7	17 51.5	·· 48.4	125 37.6	·· 32.3	35 00.3	·· 33.9	318 34.9	141	·11 55.7	+101
10	290 27.3	290 05.6	33.4	32 52.2	48.6	140 40.4	32.4	50 02.6	33.9	333 08.0	141	11 45.6	+102
11	305 29.8	305 05.4	32.1	47 52.9	48.8	155 43.2	32.5	65 05.0	34.0	347 41.1	142	11 35.4	+102
12	320 32.3	320 05.2	− 0 30.8	62 53.6	−22 48.9	170 46.0	+13 32.7	80 07.3	−18 34.0	2 14.3	141	−11 25.2	+104
13	335 34.7	335 04.9	29.5	77 54.3	49.1	185 48.8	32.8	95 09.6	34.0	16 47.4	142	11 14.8	+103
14	350 37.2	350 04.7	28.1	92 55.0	49.3	200 51.5	32.9	110 12.0	34.0	31 20.6	142	11 04.5	+104
15	5 39.7	5 04.5	·· 26.8	107 55.7	·· 49.5	215 54.3	·· 33.0	125 14.3	·· 34.0	45 53.8	142	·10 54.1	+105
16	20 42.1	20 04.3	25.5	122 56.4	49.6	230 57.1	33.1	140 16.6	34.0	60 27.0	142	10 43.6	+105
17	35 44.6	35 04.0	24.2	137 57.1	49.8	245 59.9	33.2	155 19.0	34.1	75 00.2	143	10 33.1	+106
18	50 47.1	50 03.8	− 0 22.9	152 57.8	−22 50.0	261 02.7	+13 33.4	170 21.3	−18 34.1	89 33.5	142	−10 22.5	+106
19	65 49.5	65 03.6	21.6	167 58.5	50.2	276 05.4	33.5	185 23.6	34.1	104 06.7	143	10 11.9	+107
20	80 52.0	80 03.3	20.3	182 59.2	50.3	291 08.2	33.6	200 26.0	34.1	118 40.0	143	10 01.2	+107
21	95 54.4	95 03.1	·· 18.9	197 59.8	·· 50.5	306 11.0	·· 33.7	215 28.3	·· 34.1	133 13.3	143	· 9 50.5	+107
22	110 56.9	110 02.9	17.6	213 00.5	50.7	321 13.8	33.8	230 30.7	34.2	147 46.6	143	9 39.8	+108
23	125 59.4	125 02.7	16.3	228 01.2	50.8	336 16.6	33.9	245 33.0	34.2	162 19.9	144	9 29.0	+109
24	141 01.8	140 02.4	− 0 15.0	243 01.9	−22 51.0	351 19.3	+13 34.1	260 35.3	−18 34.2	176 53.3	143	− 9 18.1	+109
code	—	− 2	+ 13	+ 7	− 2	+ 28	+ 2	+ 23	− 1				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
9 00	176 26.2	−15 03.8	7	Acamar	315 50.9	−40 29.0
01	191 26.1	03.0	5	Achernar	335 58.9	−57 27.8
02	206 26.1	02.2	30	Acrux	173 57.0	−62 51.3
03	221 26.1	01.4	19	Adhara	255 46.0	−28 54.9
04	236 26.1	15 00.7	10	Aldebaran	291 38.6	+16 25.4
05	251 26.0	14 59.9				
06	266 26.0	−14 59.1	32	Alioth	166 57.9	+56 11.5
07	281 26.0	58.3	34	Alkaid	153 32.5	+49 31.5
08	296 25.9	57.5	55	Al Na'ir	28 38.0	−47 10.5
09	311 25.9	56.7	15	Alnilam	276 29.8	− 1 13.8
10	326 25.9	55.9	25	Alphard	218 38.0	− 8 28.3
11	341 25.9	55.1				
12	356 25.9	−14 54.3	41	Alphecca	126 47.4	+26 51.4
13	11 25.8	53.5	1	Alpheratz	358 28.3	+28 51.0
14	26 25.8	52.7	51	Altair	62 50.4	+ 8 45.0
15	41 25.8	51.9	2	Ankaa	353 58.3	−42 32.8
16	56 25.8	51.1	42	Antares	113 19.1	−26 20.1
17	71 25.7	50.3				
18	86 25.7	−14 49.5	37	Arcturus	146 34.8	+19 24.3
19	101 25.7	48.7	43	Atria	108 59.8	−68 56.8
20	116 25.7	47.9	22	Avior	234 35.0	−59 22.3
21	131 25.7	47.1	13	Bellatrix	279 17.9	+ 6 18.6
22	146 25.6	46.3	16	Betelg'se	271 47.6	+ 7 23.9
23	161 25.6	45.5				
			17	Canopus	264 14.8	−52 40.5
10 00	176 25.6	−14 44.7	12	Capella	281 37.7	+45 57.5
01	191 25.6	43.9	53	Deneb	50 01.2	+45 07.4
02	206 25.6	43.1	28	Denebola	183 17.1	+14 48.8
03	221 25.5	42.3	4	Diphda	349 39.1	− 18 13.7
04	236 25.5	41.5				
05	251 25.5	40.7	27	Dubhe	194 43.6	+61 59.0
06	266 25.5	−14 39.9	14	Elnath	279 06.7	+28 34.4
07	281 25.5	39.1	47	Eltanin	91 06.4	+51 29.4
08	296 25.5	38.3	54	Enif	34 29.6	+ 9 40.4
09	311 25.4	37.5	56	Fomalhaut	16 11.6	−29 51.3
10	326 25.4	36.7				
11	341 25.4	35.9	31	Gacrux	172 48.5	−56 52.0
12	356 25.4	−14 35.1	29	Gienah	176 36.3	−17 18.1
13	11 25.4	34.3	35	Hadar	149 48.8	−60 09.6
14	26 25.4	33.5	6	Hamal	328 49.4	+23 15.5
15	41 25.4	32.7	48	Kaus Aust.	84 41.0	−34 24.4
16	56 25.3	31.9				
17	71 25.3	31.1	40	Kochab	137 17.8	+74 19.7
18	86 25.3	−14 30.3	57	Markab	14 21.4	+14 58.2
19	101 25.3	29.4	8	Menkar	315 00.0	+ 3 55.1
20	116 25.3	28.6	36	Menkent	148 58.2	−36 09.3
21	131 25.3	27.8	24	Miapl'dus	221 48.0	−69 32.3
22	146 25.3	27.0				
23	161 25.2	26.2	9	Mirfak	309 41.9	+49 42.6
			50	Nunki	76 51.8	−26 21.1
11 00	176 25.2	−14 25.4	52	Peacock	54 27.4	−56 52.5
01	191 25.2	24.6	21	Pollux	244 19.9	+28 07.9
02	206 25.2	23.8	20	Procyon	245 44.4	+ 5 20.2
03	221 25.2	23.0				
04	236 25.2	22.2	46	R'alhague	96 46.5	+12 35.3
05	251 25.2	21.3	26	Regulus	208 28.9	+12 10.7
06	266 25.2	−14 20.5	11	Rigel	281 53.2	− 8 15.2
07	281 25.2	19.7	38	Rigil Kent.	140 50.4	−60 39.2
08	296 25.2	18.9	44	Sabik	103 02.0	−15 40.3
09	311 25.2	18.1				
10	326 25.1	17.3	3	Schedar	350 30.0	+56 18.1
11	341 25.1	16.5	45	Shaula	97 20.5	−37 04.3
12	356 25.1	−14 15.6	18	Sirius	259 11.3	−16 39.5
13	11 25.1	14.8	33	Spica	159 16.4	−10 56.1
14	26 25.1	14.0	23	Suhail	223 23.6	−43 15.5
15	41 25.1	13.2				
16	56 25.1	12.4	49	Vega	81 08.4	+38 44.3
17	71 25.1	11.6	39	Zub'g'bi	137 53.0	−15 51.7
18	86 25.1	−14 10.7				
19	101 25.1	09.9				
20	116 25.1	09.1				
21	131 25.1	08.3				
22	146 25.1	07.5				
23	161 25.1	06.6				
24	176 25.1	−14 05.8				
code	−	+ 8				

Lat.	Sunrise	Twlt. begins
N °	h m	h m
72	9 30	5 24
70	9 03	5 27
68	8 43	5 29
66	8 27	5 31
64	8 14	5 32
62	8 03	5 33
60	7 54	5 34
58	7 46	5 33
56	7 39	5 34
54	7 32	5 33
52	7 26	5 33
50	7 21	5 33
45	7 10	5 31
40	7 00	5 29
35	6 52	5 27
30	6 45	5 25
20	6 32	5 18
10	6 21	5 09
0	6 11	5 00
10	6 00	4 47
20	5 49	4 30
30	5 36	4 08
35	5 28	3 54
40	5 19	3 35
45	5 09	3 11
50	4 56	2 36
52	4 50	2 17
54	4 44	1 54
56	4 36	1 16
58	4 28	////
60	4 19	////
S		

Moonrise 9	10	11	12
h m	h m	h m	h m
▬	9 04	8 30	8 08
8 56	8 26	8 09	7 57
8 08	8 00	7 53	7 47
7 38	7 40	7 40	7 40
7 15	7 23	7 29	7 33
6 56	7 10	7 20	7 27
6 41	6 58	7 12	7 22
6 28	6 48	7 04	7 18
6 16	6 39	6 58	7 14
6 07	6 32	6 52	7 10
5 58	6 25	6 47	7 07
5 50	6 18	6 42	7 04
5 33	6 04	6 32	6 58
5 19	5 53	6 24	6 52
5 07	5 43	6 17	6 48
4 57	5 35	6 10	6 44
4 39	5 20	5 59	6 37
4 23	5 07	5 49	6 30
4 09	4 55	5 40	6 24
3 54	4 43	5 31	6 18
3 39	4 30	5 21	6 12
3 21	4 15	5 10	6 05
3 10	4 06	5 03	6 00
2 58	3 56	4 56	5 56
2 44	3 45	4 47	5 50
2 26	3 30	4 36	5 43
2 18	3 24	4 31	5 40
2 09	3 16	4 26	5 37
1 59	3 08	4 20	5 33
1 47	2 59	4 13	5 29
1 33	2 48	4 06	5 24

Lat.	Sunset	Twlt. ends
N °	h m	h m
72	15 00	19 09
70	15 27	19 06
68	15 47	19 04
66	16 02	19 01
64	16 15	19 00
62	16 26	18 59
60	16 35	18 58
58	16 44	18 58
56	16 51	18 58
54	16 57	18 57
52	17 03	18 58
50	17 08	18 58
45	17 19	18 58
40	17 29	19 01
35	17 37	19 03
30	17 44	19 05
20	17 56	19 11
10	18 07	19 19
0	18 18	19 29
10	18 28	19 41
20	18 40	19 58
30	18 53	20 19
35	19 00	20 33
40	19 09	20 51
45	19 19	21 15
50	19 32	21 49
52	19 37	22 06
54	19 44	22 30
56	19 51	23 03
58	19 59	////
60	20 08	////
S		

Moonset 9	10	11	12
h m	h m	h m	h m
▬	13 25	15 32	17 26
11 56	14 01	15 51	17 35
12 42	14 26	16 06	17 42
13 13	14 45	16 17	17 49
13 35	15 01	16 27	17 54
13 53	15 14	16 36	17 58
14 08	15 25	16 43	18 02
14 20	15 34	16 49	18 05
14 31	15 42	16 55	18 09
14 41	15 49	17 00	18 11
14 49	15 56	17 04	18 14
14 57	16 02	17 08	18 16
15 13	16 14	17 17	18 21
15 26	16 25	17 24	18 25
15 37	16 34	17 31	18 28
15 47	16 41	17 36	18 31
16 03	16 55	17 46	18 36
16 18	17 06	17 54	18 41
16 31	17 17	18 01	18 45
16 45	17 28	18 09	18 49
16 59	17 39	18 17	18 54
17 15	17 52	18 26	18 59
17 25	17 59	18 31	19 02
17 35	18 08	18 37	19 05
17 48	18 18	18 44	19 09
18 03	18 29	18 52	19 13
18 10	18 35	18 56	19 15
18 18	18 41	19 00	19 17
18 27	18 48	19 05	19 20
18 37	18 55	19 10	19 22
18 48	19 04	19 15	19 25

GMT	Equation of Time (App. − Mean) 9	10	11
h	m s	m s	m s
0	−14 15.3	−14 17.6	−14 19.0
6	−14 16.0	−14 18.0	−14 19.3
12	−14 16.5	−14 18.4	−14 19.5
18	−14 17.1	−14 18.7	−14 19.6
24	−14 17.6	−14 19.0	−14 19.7

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
9	10 20	14 39	7 51	0 48	6 48
10	11 06	14 39	7 50	0 44	6 44
11	11 51	14 40	7 49	0 39	6 40
12	12 35	14 40	7 48	0 35	6 37

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.5	0.1	0.1
30	0.5	0.1	0.1
45	0.5	0.1	0.1
60	0.5	0.0	0.0
75	0.5	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	9	10	11
°	′	′	′
0	12.0	12.4	12.8
4	12.0	12.4	12.8
8	12.0	12.4	12.8
12	12.1	12.4	12.8
16	12.1	12.5	12.9
20	12.2	12.6	12.9
24	12.3	12.6	13.0
28	12.4	12.7	13.0
32	12.5	12.8	13.1
36	12.6	12.9	13.2
40	12.7	13.0	13.3
44	12.8	13.1	13.4
48	13.0	13.3	13.5
52	13.1	13.4	13.7
56	13.3	13.5	13.8
60	13.5	13.7	13.9
64	13.6	13.9	14.1
68	13.8	14.0	14.2
72	14.0	14.2	14.3
76	14.2	14.4	14.5
80	14.4	14.5	14.6
84	14.6	14.7	14.8
88	14.7	14.8	14.9
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	9	10	11
°	′	′	′
0	17.6	17.4	17.2
4	17.6	17.4	17.1
8	17.5	17.3	17.1
12	17.5	17.3	17.1
16	17.5	17.2	17.0
20	17.4	17.2	17.0
24	17.3	17.1	16.9
28	17.2	17.0	16.9
32	17.1	16.9	16.8
36	17.0	16.8	16.7
40	16.9	16.7	16.6
44	16.7	16.6	16.5
48	16.6	16.5	16.4
52	16.4	16.3	16.2
56	16.3	16.2	16.1
60	16.1	16.0	16.0
64	15.9	15.9	15.8
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.3
84	15.0	15.0	15.1
88	14.8	14.9	15.0
90			

Subtract from table, back cover

New Moon 11

GMT	♈ GHA	VENUS −3.5 GHA	VENUS −3.5 Dec.	MARS 1.4 GHA	MARS 1.4 Dec.	JUPITER −2.1 GHA	JUPITER −2.1 Dec.	SATURN 0.7 GHA	SATURN 0.7 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
12 0	141 01.8	140 02.4	− 0 15.0	243 01.9	−22 51.0	351 19.3	+13 34.1	260 35.3	−18 34.2	176 53.3	143	− 9 18.1	+109
1	156 04.3	155 02.2	13.7	258 02.6	51.2	6 22.1	34.2	275 37.7	34.2	191 26.6	144	9 07.2	+109
2	171 06.8	170 02.0	12.4	273 03.3	51.4	21 24.9	34.3	290 40.0	34.2	206 00.0	144	8 56.3	+110
3	186 09.2	185 01.8	·· 11.1	288 04.0	·· 51.5	36 27.7	·· 34.4	305 42.4	·· 34.2	220 33.4	144	· 8 45.3	+110
4	201 11.7	200 01.5	09.8	303 04.7	51.7	51 30.5	34.5	320 44.7	34.3	235 06.8	144	8 34.3	+111
5	216 14.2	215 01.3	08.4	318 05.4	51.9	66 33.2	34.7	335 47.0	34.3	249 40.2	144	8 23.2	+111
6	231 16.6	230 01.1	− 0 07.1	333 06.1	−22 52.0	81 36.0	+13 34.8	350 49.4	−18 34.3	264 13.6	144	− 8 12.1	+112
7	246 19.1	245 00.9	05.8	348 06.8	52.2	96 38.8	34.9	5 51.7	34.3	278 47.0	144	8 00.9	+112
8	261 21.6	260 00.6	04.5	3 07.5	52.4	111 41.6	35.0	20 54.0	34.3	293 20.4	145	7 49.7	+112
9	276 24.0	275 00.4	·· 03.2	18 08.1	·· 52.5	126 44.4	·· 35.1	35 56.4	·· 34.3	307 53.9	144	· 7 38.5	+113
10	291 26.5	290 00.2	01.9	33 08.8	52.7	141 47.1	35.2	50 58.7	34.4	322 27.3	145	7 27.2	+113
11	306 28.9	304 59.9	− 0 00.6	48 09.5	52.9	156 49.9	35.4	66 01.1	34.4	337 00.8	144	7 15.9	+113
12	321 31.4	319 59.7	+ 0 00.8	63 10.2	−22 53.0	171 52.7	+13 35.5	81 03.4	−18 34.4	351 34.2	145	− 7 04.6	+114
13	336 33.9	334 59.5	02.1	78 10.9	53.2	186 55.5	35.6	96 05.7	34.4	6 07.7	145	6 53.2	+114
14	351 36.3	349 59.3	03.4	93 11.6	53.4	201 58.3	35.7	111 08.1	34.4	20 41.2	145	6 41.8	+114
15	6 38.8	4 59.0	·· 04.7	108 12.3	·· 53.5	217 01.0	·· 35.8	126 10.4	·· 34.4	35 14.7	144	· 6 30.4	+115
16	21 41.3	19 58.8	06.0	123 13.0	53.7	232 03.8	35.9	141 12.8	34.5	49 48.1	145	6 18.9	+115
17	36 43.7	34 58.6	07.3	138 13.7	53.9	247 06.6	36.1	156 15.1	34.5	64 21.6	145	6 07.4	+116
18	51 46.2	49 58.4	+ 0 08.6	153 14.4	−22 54.0	262 09.4	+13 36.2	171 17.5	−18 34.5	78 55.1	145	− 5 55.8	+116
19	66 48.7	64 58.2	10.0	168 15.1	54.2	277 12.2	36.3	186 19.8	34.5	93 28.6	145	5 44.2	+116
20	81 51.1	79 57.9	11.3	183 15.7	54.4	292 14.9	36.4	201 22.1	34.5	108 02.1	145	5 32.6	+116
21	96 53.6	94 57.7	·· 12.6	198 16.4	·· 54.5	307 17.7	·· 36.5	216 24.5	·· 34.5	122 35.6	145	· 5 21.0	+117
22	111 56.0	109 57.5	13.9	213 17.1	54.7	322 20.5	36.6	231 26.8	34.6	137 09.1	145	5 09.3	+117
23	126 58.5	124 57.3	15.2	228 17.8	54.8	337 23.3	36.8	246 29.2	34.6	151 42.6	145	4 57.6	+117
13 0	142 01.0	139 57.0	+ 0 16.5	243 18.5	−22 55.0	352 26.1	+13 36.9	261 31.5	−18 34.6	166 16.1	145	− 4 45.9	+118
1	157 03.4	154 56.8	17.8	258 19.2	55.2	7 28.8	37.0	276 33.8	34.6	180 49.6	145	4 34.1	+118
2	172 05.9	169 56.6	19.2	273 19.9	55.3	22 31.6	37.1	291 36.2	34.6	195 23.1	145	4 22.3	+118
3	187 08.4	184 56.4	·· 20.5	288 20.6	·· 55.5	37 34.4	·· 37.2	306 38.5	·· 34.6	209 56.6	145	· 4 10.5	+118
4	202 10.8	199 56.1	21.8	303 21.3	55.7	52 37.2	37.3	321 40.9	34.6	224 30.1	145	3 58.7	+118
5	217 13.3	214 55.9	23.1	318 22.0	55.8	67 40.0	37.5	336 43.2	34.7	239 03.6	145	3 46.9	+119
6	232 15.8	229 55.7	+ 0 24.4	333 22.7	−22 56.0	82 42.7	+13 37.6	351 45.6	−18 34.7	253 37.1	145	− 3 35.0	+119
7	247 18.2	244 55.5	25.7	348 23.3	56.1	97 45.5	37.7	6 47.9	34.7	268 10.6	144	3 23.1	+119
8	262 20.7	259 55.3	27.0	3 24.0	56.3	112 48.3	37.8	21 50.2	34.7	282 44.0	145	3 11.2	+120
9	277 23.2	274 55.0	·· 28.4	18 24.7	·· 56.5	127 51.1	·· 37.9	36 52.6	·· 34.7	297 17.5	145	· 2 59.2	+119
10	292 25.6	289 54.8	29.7	33 25.4	56.6	142 53.9	38.1	51 54.9	34.7	311 51.0	144	2 47.3	+120
11	307 28.1	304 54.6	31.0	48 26.1	56.8	157 56.7	38.2	66 57.3	34.8	326 24.4	145	2 35.3	+120
12	322 30.5	319 54.4	+ 0 32.3	63 26.8	−22 56.9	172 59.4	+13 38.3	81 59.6	−18 34.8	340 57.9	144	− 2 23.3	+120
13	337 33.0	334 54.2	33.6	78 27.5	57.1	188 02.2	38.4	97 02.0	34.8	355 31.3	144	2 11.3	+121
14	352 35.5	349 53.9	34.9	93 28.2	57.3	203 05.0	38.5	112 04.3	34.8	10 04.7	144	1 59.2	+120
15	7 37.9	4 53.7	·· 36.2	108 28.9	·· 57.4	218 07.8	·· 38.6	127 06.7	·· 34.8	24 38.1	144	· 1 47.2	+121
16	22 40.4	19 53.5	37.6	123 29.6	57.6	233 10.6	38.8	142 09.0	34.8	39 11.5	144	1 35.1	+120
17	37 42.9	34 53.3	38.9	138 30.2	57.7	248 13.3	38.9	157 11.3	34.9	53 44.9	144	1 23.1	+121
18	52 45.3	49 53.1	+ 0 40.2	153 30.9	−22 57.9	263 16.1	+13 39.0	172 13.7	−18 34.9	68 18.3	144	− 1 11.0	+121
19	67 47.8	64 52.8	41.5	168 31.6	58.0	278 18.9	39.1	187 16.0	34.9	82 51.7	143	0 58.9	+121
20	82 50.3	79 52.6	42.8	183 32.3	58.2	293 21.7	39.2	202 18.4	34.9	97 25.0	143	0 46.8	+121
21	97 52.7	94 52.4	·· 44.1	198 33.0	·· 58.4	308 24.5	·· 39.3	217 20.7	·· 34.9	111 58.3	143	· 0 34.7	+122
22	112 55.2	109 52.2	45.4	213 33.7	58.5	323 27.3	39.5	232 23.1	34.9	126 31.6	143	0 22.5	+121
23	127 57.7	124 52.0	46.8	228 34.4	58.7	338 30.0	39.6	247 25.4	34.9	141 04.9	143	− 0 10.4	+122
14 0	143 00.1	139 51.7	+ 0 48.1	243 35.1	−22 58.8	353 32.8	+13 39.7	262 27.8	−18 35.0	155 38.2	143	+ 0 01.8	+121
1	158 02.6	154 51.5	49.4	258 35.8	59.0	8 35.6	39.8	277 30.1	35.0	170 11.5	142	0 13.9	+122
2	173 05.0	169 51.3	50.7	273 36.4	59.1	23 38.4	39.9	292 32.5	35.0	184 44.7	142	0 26.1	+121
3	188 07.5	184 51.1	·· 52.0	288 37.1	·· 59.3	38 41.2	·· 40.0	307 34.8	·· 35.0	199 17.9	143	· 0 38.2	+122
4	203 10.0	199 50.9	53.3	303 37.8	59.4	53 43.9	40.2	322 37.1	35.0	213 51.2	141	0 50.4	+122
5	218 12.4	214 50.6	54.6	318 38.5	59.6	68 46.7	40.3	337 39.5	35.0	228 24.3	142	1 02.6	+122
6	233 14.9	229 50.4	+ 0 56.0	333 39.2	−22 59.7	83 49.5	+13 40.4	352 41.8	−18 35.1	242 57.5	141	+ 1 14.8	+121
7	248 17.4	244 50.2	57.3	348 39.9	22 59.9	98 52.3	40.5	7 44.2	35.1	257 30.6	141	1 26.9	+122
8	263 19.8	259 50.0	58.6	3 40.6	23 00.1	113 55.1	40.6	22 46.5	35.1	272 03.7	141	1 39.1	+122
9	278 22.3	274 49.8	· 0 59.9	18 41.3	·· 00.2	128 57.9	·· 40.7	37 48.9	·· 35.1	286 36.8	141	· 1 51.3	+122
10	293 24.8	289 49.6	1 01.2	33 42.0	00.4	144 00.6	40.9	52 51.2	35.1	301 09.9	140	2 03.5	+122
11	308 27.2	304 49.3	02.5	48 42.6	00.5	159 03.4	41.0	67 53.6	35.1	315 42.9	140	2 15.7	+121
12	323 29.7	319 49.1	+ 1 03.8	63 43.3	−23 00.7	174 06.2	+13 41.1	82 55.9	−18 35.1	330 15.9	140	+ 2 27.8	+122
13	338 32.1	334 48.9	05.1	78 44.0	00.8	189 09.0	41.2	97 58.3	35.2	344 48.9	139	2 40.0	+122
14	353 34.6	349 48.7	06.5	93 44.7	01.0	204 11.8	41.3	113 00.6	35.2	359 21.8	140	2 52.2	+121
15	8 37.1	4 48.5	·· 07.8	108 45.4	·· 01.1	219 14.5	·· 41.5	128 03.0	·· 35.2	13 54.8	139	· 3 04.3	+122
16	23 39.5	19 48.3	09.1	123 46.1	01.3	234 17.3	41.6	143 05.3	35.2	28 27.7	138	3 16.5	+121
17	38 42.0	34 48.0	10.4	138 46.8	01.4	249 20.1	41.7	158 07.7	35.2	43 00.5	138	3 28.6	+122
18	53 44.5	49 47.8	+ 1 11.7	153 47.5	−23 01.6	264 22.9	+13 41.8	173 10.0	−18 35.2	57 33.3	138	+ 3 40.8	+121
19	68 46.9	64 47.6	13.0	168 48.1	01.7	279 25.7	41.9	188 12.4	35.3	72 06.1	138	3 52.9	+121
20	83 49.4	79 47.4	14.3	183 48.8	01.9	294 28.5	42.0	203 14.7	35.3	86 38.9	137	4 05.0	+121
21	98 51.9	94 47.2	·· 15.7	198 49.5	·· 02.0	309 31.2	·· 42.2	218 17.1	·· 35.3	101 11.6	137	· 4 17.1	+121
22	113 54.3	109 47.0	17.0	213 50.2	02.2	324 34.0	42.3	233 19.4	35.3	115 44.3	137	4 29.2	+121
23	128 56.8	124 46.7	18.3	228 50.9	02.3	339 36.8	42.4	248 21.8	35.3	130 17.0	136	4 41.3	+121
24	143 59.3	139 46.5	+ 1 19.6	243 51.6	−23 02.5	354 39.6	+13 42.5	263 24.1	−18 35.3	144 49.6	136	+ 4 53.4	+120
code	—	− 2	+ 13	+ 7	− 2	+ 28	+ 1	+ 24	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
12 00	176 25.1	−14 05.8	7	Acamar	315 50.9	−40 29.0
01	191 25.1	05.0	5	Achernar	335 58.9	−57 27.8
02	206 25.1	04.2	30	Acrux	173 56.9	−62 51.3
03	221 25.1	03.4	19	Adhara	255 46.0	−28 54.9
04	236 25.1	02.5	10	Aldebaran	291 38.6	+16 25.4
05	251 25.1	01.7				
06	266 25.1	−14 00.9	32	Alioth	166 57.9	+56 11.5
07	281 25.1	14 00.1	34	Alkaid	153 32.4	+49 31.5
08	296 25.1	13 59.2	55	Al Na'ir	28 38.0	−47 10.5
09	311 25.1	58.4	15	Alnilam	276 29.8	− 1 13.8
10	326 25.1	57.6	25	Alphard	218 38.0	− 8 28.3
11	341 25.1	56.8				
12	356 25.1	−13 55.9	41	Alphecca	126 47.4	+26 51.4
13	11 25.1	55.1	1	Alpheratz	358 28.3	+28 51.0
14	26 25.1	54.3	51	Altair	62 50.4	+ 8 45.0
15	41 25.1	53.5	2	Ankaa	353 58.3	−42 32.8
16	56 25.1	52.6	42	Antares	113 19.1	−26 20.2
17	71 25.1	51.8				
18	86 25.1	−13 51.0	37	Arcturus	146 34.8	+19 24.3
19	101 25.1	50.2	43	Atria	108 59.7	−68 56.8
20	116 25.1	49.3	22	Avior	234 35.0	−59 22.3
21	131 25.1	48.5	13	Bellatrix	279 17.9	+ 6 18.6
22	146 25.1	47.7	16	Betelg'se	271 47.6	+ 7 23.9
23	161 25.1	46.8				
			17	Canopus	264 14.9	−52 40.6
13 00	176 25.1	−13 46.0	12	Capella	281 37.7	+45 57.5
01	191 25.1	45.2	53	Deneb	50 01.2	+45 07.3
02	206 25.1	44.4	28	Denebola	183 17.1	+14 48.8
03	221 25.1	43.5	4	Diphda	349 39.2	−18 13.7
04	236 25.1	42.7				
05	251 25.1	41.9	27	Dubhe	194 43.6	+61 59.0
06	266 25.1	−13 41.0	14	Elnath	279 06.8	+28 34.4
07	281 25.1	40.2	47	Eltanin	91 06.4	+51 29.4
08	296 25.2	39.4	54	Enif	34 29.6	+ 9 40.4
09	311 25.2	38.5	56	Fomalhaut	16 11.6	−29 51.3
10	326 25.2	37.7				
11	341 25.2	36.9	31	Gacrux	172 48.5	−56 52.0
12	356 25.2	−13 36.0	29	Gienah	176 36.3	−17 18.1
13	11 25.2	35.2	35	Hadar	149 48.7	−60 09.6
14	26 25.2	34.4	6	Hamal	328 49.4	+23 15.5
15	41 25.2	33.5	48	Kaus Aust.	84 41.0	−34 24.4
16	56 25.2	32.7				
17	71 25.2	31.8	40	Kochab	137 17.8	+74 19.7
18	86 25.2	−13 31.0	57	Markab	14 21.4	+14 58.2
19	101 25.3	30.2	8	Menkar	315 00.0	+ 3 55.1
20	116 25.3	29.3	36	Menkent	148 58.1	−36 09.3
21	131 25.3	28.5	24	Miapl'dus	221 48.0	−69 32.3
22	146 25.3	27.7				
23	161 25.3	26.8	9	Mirfak	309 41.9	+49 42.6
			50	Nunki	76 51.8	−26 21.1
14 00	176 25.3	−13 26.0	52	Peacock	54 27.4	−56 52.5
01	191 25.3	25.1	21	Pollux	244 19.9	+28 07.9
02	206 25.3	24.3	20	Procyon	245 44.4	+ 5 20.1
03	221 25.4	23.5				
04	236 25.4	22.6	46	R'alhague	96 46.5	+12 35.3
05	251 25.4	21.8	26	Regulus	208 28.8	+12 10.7
06	266 25.4	−13 20.9	11	Rigel	281 53.2	− 8 15.2
07	281 25.4	20.1	38	Rigil Kent.	140 50.4	−60 39.2
08	296 25.4	19.3	44	Sabik	103 02.0	−15 40.4
09	311 25.4	18.4				
10	326 25.5	17.6	3	Schedar	350 30.0	+56 18.1
11	341 25.5	16.7	45	Shaula	97 20.5	−37 04.3
12	356 25.5	−13 15.9	18	Sirius	259 11.3	−16 39.5
13	11 25.5	15.0	33	Spica	159 16.4	−10 56.1
14	26 25.5	14.2	23	Suhail	223 23.6	−43 15.5
15	41 25.5	13.3				
16	56 25.6	12.5	49	Vega	81 08.3	+38 44.3
17	71 25.6	11.7	39	Zub'g'bi	137 52.9	−15 51.7
18	86 25.6	−13 10.8				
19	101 25.6	10.0				
20	116 25.6	09.1				
21	131 25.7	08.3				
22	146 25.7	07.4				
23	161 25.7	06.6				
24	176 25.7	−13 05.7				
code	—	+ 8				

GMT	Equation of Time (App. Mean) 12	13	14
h	m s	m s	m s
0	−14 19.7	−14 19.6	−14 18.8
6	−14 19.8	−14 19.5	−14 18.4
12	−14 19.8	−14 19.3	−14 18.1
18	−14 19.7	−14 19.1	−14 17.6
24	−14 19.6	−14 18.8	−14 17.2

Lat.	Sunrise	Twlt. begins	Moonrise 12	13	14	15
N °	h m	h m	h m	h m	h m	h m
72	9 11	5 12	8 08	7 50	7 33	7 16
70	8 48	5 16	7 57	7 46	7 35	7 24
68	8 30	5 20	7 47	7 42	7 37	7 31
66	8 16	5 22	7 40	7 39	7 38	7 37
64	8 05	5 24	7 33	7 36	7 39	7 43
62	7 55	5 26	7 27	7 34	7 40	7 47
60	7 46	5 27	7 22	7 32	7 41	7 51
58	7 39	5 27	7 18	7 30	7 42	7 54
56	7 32	5 28	7 14	7 29	7 43	7 57
54	7 26	5 28	7 10	7 27	7 43	8 00
52	7 21	5 29	7 07	7 26	7 44	8 03
50	7 16	5 29	7 04	7 25	7 44	8 05
45	7 06	5 28	6 58	7 22	7 46	8 10
40	6 57	5 27	6 52	7 20	7 46	8 14
35	6 49	5 25	6 48	7 18	7 47	8 18
30	6 43	5 22	6 44	7 16	7 48	8 21
20	6 31	5 16	6 37	7 13	7 50	8 27
10	6 21	5 10	6 30	7 10	7 51	8 32
0	6 11	5 00	6 24	7 08	7 52	8 37
10	6 01	4 48	6 18	7 06	7 53	8 42
20	5 50	4 33	6 12	7 03	7 54	8 47
30	5 38	4 11	6 05	7 00	7 56	8 53
35	5 31	3 58	6 00	6 58	7 57	8 57
40	5 23	3 41	5 56	6 56	7 58	9 00
45	5 13	3 18	5 50	6 54	7 59	9 05
50	5 01	2 46	5 43	6 51	8 00	9 11
52	4 56	2 29	5 40	6 50	8 01	9 13
54	4 50	2 08	5 37	6 49	8 02	9 16
56	4 43	1 38	5 33	6 47	8 03	9 19
58	4 36	0 43	5 29	6 46	8 03	9 23
60 S	4 27	////	5 24	6 44	8 04	9 27

Lat.	Sunset	Twlt. ends	Moonset 12	13	14	15
N °	h m	h m	h m	h m	h m	h m
72	15 19	19 22	17 26	19 16	21 08	23 05
70	15 42	19 17	17 35	19 18	21 02	22 50
68	15 59	19 13	17 42	19 19	20 57	22 38
66	16 13	19 10	17 49	19 20	20 52	22 28
64	16 25	19 08	17 54	19 21	20 49	22 19
62	16 35	19 07	17 58	19 22	20 46	22 12
60	16 43	19 05	18 02	19 22	20 43	22 06
58	16 51	19 04	18 05	19 23	20 41	22 01
56	16 57	19 03	18 09	19 23	20 39	21 56
54	17 03	19 03	18 11	19 24	20 37	21 52
52	17 09	19 03	18 14	19 24	20 35	21 48
50	17 13	19 02	18 16	19 24	20 34	21 45
45	17 24	19 03	18 21	19 25	20 31	21 37
40	17 32	19 03	18 25	19 26	20 28	21 31
35	17 40	19 05	18 28	19 26	20 25	21 26
30	17 46	19 07	18 31	19 27	20 23	21 21
20	17 58	19 12	18 36	19 28	20 20	21 13
10	18 08	19 19	18 41	19 28	20 16	21 06
0	18 18	19 29	18 45	19 29	20 13	20 59
10	18 27	19 39	18 49	19 30	20 10	20 53
20	18 38	19 55	18 54	19 30	20 07	20 46
30	18 50	20 16	18 59	19 31	20 04	20 38
35	18 57	20 29	19 02	19 31	20 01	20 33
40	19 05	20 46	19 05	19 32	19 59	20 28
45	19 15	21 09	19 09	19 32	19 56	20 22
50	19 26	21 39	19 13	19 33	19 53	20 15
52	19 31	21 55	19 15	19 33	19 52	20 11
54	19 37	22 15	19 17	19 34	19 50	20 08
56	19 44	22 43	19 20	19 34	19 48	20 04
58	19 51	23 30	19 22	19 34	19 46	19 59
60 S	20 00	////	19 25	19 35	19 44	19 54

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
12	12 35	14 40	7 48	0 35	6 37
13	13 19	14 40	7 46	0 30	6 33
14	14 03	14 41	7 45	0 26	6 29
15	14 48	14 41	7 44	0 21	6 25

GMT of Transit
Meridian of Greenwich

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.5	0.1	0.1
30	0.5	0.1	0.1
45	0.5	0.1	0.1
60	0.5	0.0	0.0
75	0.5	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	12	13	14
°	′	′	′
0	13.3	13.8	14.4
4	13.3	13.8	14.4
8	13.3	13.8	14.4
12	13.3	13.8	14.4
16	13.3	13.8	14.4
20	13.4	13.9	14.5
24	13.4	13.9	14.5
28	13.5	14.0	14.5
32	13.6	14.0	14.6
36	13.6	14.1	14.6
40	13.7	14.1	14.6
44	13.8	14.2	14.7
48	13.9	14.3	14.7
52	14.0	14.3	14.8
56	14.1	14.4	14.8
60	14.2	14.5	14.9
64	14.3	14.6	14.9
68	14.4	14.7	15.0
72	14.6	14.8	15.1
76	14.7	14.9	15.1
80	14.8	15.0	15.2
84	14.9	15.1	15.2
88	15.0	15.1	15.3
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	12	13	14
°	′	′	′
0	16.9	16.6	16.2
4	16.8	16.6	16.2
8	16.8	16.5	16.2
12	16.8	16.5	16.2
16	16.8	16.5	16.2
20	16.7	16.5	16.1
24	16.7	16.4	16.1
28	16.6	16.4	16.1
32	16.6	16.3	16.1
36	16.5	16.3	16.0
40	16.4	16.2	16.0
44	16.3	16.1	15.9
48	16.2	16.1	15.9
52	16.1	16.0	15.8
56	16.0	15.9	15.8
60	15.9	15.8	15.7
64	15.8	15.7	15.7
68	15.7	15.6	15.6
72	15.6	15.6	15.6
76	15.4	15.5	15.5
80	15.3	15.4	15.4
84	15.2	15.3	15.4
88	15.1	15.2	15.3
90			

Subtract from table, back cover

Lincoln's Birthday 12

Quinquagesima (Shrove Sunday) 12

GMT	♈ GHA	VENUS −3.6 GHA	VENUS −3.6 Dec.	MARS 1.3 GHA	MARS 1.3 Dec.	JUPITER −2.1 GHA	JUPITER −2.1 Dec.	SATURN 0.7 GHA	SATURN 0.7 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
15 00	143 59.3	139 46.5	+ 1 19.6	243 51.6	−23 02.5	354 39.6	+13 42.5	263 24.1	−18 35.3	144 49.6	136	+ 4 53.4	+120
01	159 01.7	154 46.3	20.9	258 52.3	02.6	9 42.4	42.6	278 26.5	35.3	159 22.2	135	5 05.4	+121
02	174 04.2	169 46.1	22.2	273 53.0	02.7	24 45.1	42.7	293 28.8	35.4	173 54.7	135	5 17.5	+120
03	189 06.6	184 45.9	·· 23.5	288 53.6	·· 02.9	39 47.9	·· 42.9	308 31.2	·· 35.4	188 27.2	135	· 5 29.5	+120
04	204 09.1	199 45.7	24.8	303 54.3	03.0	54 50.7	43.0	323 33.5	35.4	202 59.7	134	5 41.5	+120
05	219 11.6	214 45.5	26.2	318 55.0	03.2	69 53.5	43.1	338 35.9	35.4	217 32.1	134	5 53.5	+120
06	234 14.0	229 45.2	+ 1 27.5	333 55.7	−23 03.3	84 56.3	+13 43.2	353 38.2	−18 35.4	232 04.5	133	+ 6 05.5	+119
07	249 16.5	244 45.0	28.8	348 56.4	03.5	99 59.1	43.3	8 40.6	35.4	246 36.8	133	6 17.4	+120
08	264 19.0	259 44.8	30.1	3 57.1	03.6	115 01.8	43.4	23 42.9	35.4	261 09.1	133	6 29.4	+119
09	279 21.4	274 44.6	·· 31.4	18 57.8	·· 03.8	130 04.6	·· 43.6	38 45.3	·· 35.5	275 41.4	132	· 6 41.3	+119
10	294 23.9	289 44.4	32.7	33 58.5	03.9	145 07.4	43.7	53 47.6	35.5	290 13.6	131	6 53.2	+118
11	309 26.4	304 44.2	34.0	48 59.1	04.1	160 10.2	43.8	68 50.0	35.5	304 45.7	132	7 05.0	+119
12	324 28.8	319 44.0	+ 1 35.4	63 59.8	−23 04.2	175 13.0	+13 43.9	83 52.3	−18 35.5	319 17.9	130	+ 7 16.9	+118
13	339 31.3	334 43.7	36.7	79 00.5	04.3	190 15.8	44.0	98 54.7	35.5	333 49.9	131	7 28.7	+117
14	354 33.8	349 43.5	38.0	94 01.2	04.5	205 18.5	44.1	113 57.0	35.5	348 22.0	129	7 40.4	+118
15	9 36.2	4 43.3	·· 39.3	109 01.9	·· 04.6	220 21.3	·· 44.3	128 59.4	·· 35.5	2 53.9	130	· 7 52.2	+117
16	24 38.7	19 43.1	40.6	124 02.6	04.8	235 24.1	44.4	144 01.7	35.6	17 25.9	128	8 03.9	+117
17	39 41.1	34 42.9	41.9	139 03.3	04.9	250 26.9	44.5	159 04.1	35.6	31 57.7	128	8 15.6	+117
18	54 43.6	49 42.7	+ 1 43.2	154 04.0	−23 05.1	265 29.7	+13 44.6	174 06.4	−18 35.6	46 29.5	128	+ 8 27.3	+116
19	69 46.1	64 42.5	44.5	169 04.6	05.2	280 32.4	44.7	189 08.8	35.6	61 01.3	127	8 38.9	+116
20	84 48.5	79 42.3	45.8	184 05.3	05.3	295 35.2	44.8	204 11.2	35.6	75 33.0	127	8 50.5	+116
21	99 51.0	94 42.0	·· 47.2	199 06.0	·· 05.5	310 38.0	·· 45.0	219 13.5	·· 35.6	90 04.7	126	· 9 02.1	+115
22	114 53.5	109 41.8	48.5	214 06.7	05.6	325 40.8	45.1	234 15.9	35.6	104 36.3	126	9 13.6	+115
23	129 55.9	124 41.6	49.8	229 07.4	05.8	340 43.6	45.2	249 18.2	35.7	119 07.9	125	9 25.1	+114
16 00	144 58.4	139 41.4	+ 1 51.1	244 08.1	−23 05.9	355 46.4	+13 45.3	264 20.6	−18 35.7	133 39.4	124	+ 9 36.5	+115
01	160 00.9	154 41.2	52.4	259 08.8	06.0	10 49.1	45.4	279 22.9	35.7	148 10.8	124	9 48.0	+113
02	175 03.3	169 41.0	53.7	274 09.4	06.2	25 51.9	45.5	294 25.3	35.7	162 42.2	123	9 59.3	+114
03	190 05.8	184 40.8	·· 55.0	289 10.1	·· 06.3	40 54.7	·· 45.7	309 27.6	·· 35.7	177 13.5	123	·10 10.7	+113
04	205 08.3	199 40.6	56.3	304 10.8	06.5	55 57.5	45.8	324 30.0	35.7	191 44.8	122	10 22.0	+112
05	220 10.7	214 40.3	57.7	319 11.5	06.6	71 00.3	45.9	339 32.3	35.7	206 16.0	121	10 33.2	+112
06	235 13.2	229 40.1	+ 1 59.0	334 12.2	−23 06.7	86 03.1	+13 46.0	354 34.7	−18 35.7	220 47.1	121	+10 44.4	+112
07	250 15.6	244 39.9	2 00.3	349 12.9	06.9	101 05.8	46.1	9 37.1	35.8	235 18.2	120	10 55.6	+111
08	265 18.1	259 39.7	01.6	4 13.6	07.0	116 08.6	46.2	24 39.4	35.8	249 49.2	120	11 06.7	+111
09	280 20.6	274 39.5	·· 02.9	19 14.2	·· 07.1	131 11.4	·· 46.4	39 41.8	·· 35.8	264 20.2	119	·11 17.8	+110
10	295 23.0	289 39.3	04.2	34 14.9	07.3	146 14.2	46.5	54 44.1	35.8	278 51.1	119	11 28.8	+110
11	310 25.5	304 39.1	05.5	49 15.6	07.4	161 17.0	46.6	69 46.5	35.8	293 22.0	117	11 39.8	+109
12	325 28.0	319 38.9	+ 2 06.8	64 16.3	−23 07.6	176 19.7	+13 46.7	84 48.8	−18 35.8	307 52.7	117	+11 50.7	+109
13	340 30.4	334 38.7	08.1	79 17.0	07.7	191 22.5	46.8	99 51.2	35.8	322 23.4	117	12 01.6	+108
14	355 32.9	349 38.5	09.5	94 17.7	07.8	206 25.3	46.9	114 53.5	35.9	336 54.1	116	12 12.4	+108
15	10 35.4	4 38.2	·· 10.8	109 18.4	·· 08.0	221 28.1	·· 47.1	129 55.9	·· 35.9	351 24.7	115	·12 23.2	+107
16	25 37.8	19 38.0	12.1	124 19.0	08.1	236 30.9	47.2	144 58.3	35.9	5 55.2	114	12 33.9	+106
17	40 40.3	34 37.8	13.4	139 19.7	08.2	251 33.7	47.3	160 00.6	35.9	20 25.6	114	12 44.5	+106
18	55 42.7	49 37.6	+ 2 14.7	154 20.4	−23 08.4	266 36.4	+13 47.4	175 03.0	−18 35.9	34 56.0	113	+12 55.1	+106
19	70 45.2	64 37.4	16.0	169 21.1	08.5	281 39.2	47.5	190 05.3	35.9	49 26.3	112	13 05.7	+104
20	85 47.7	79 37.2	17.3	184 21.8	08.6	296 42.0	47.6	205 07.7	35.9	63 56.5	112	13 16.1	+105
21	100 50.1	94 37.0	·· 18.6	199 22.5	·· 08.8	311 44.8	·· 47.8	220 10.0	·· 35.9	78 26.7	111	·13 26.6	+103
22	115 52.6	109 36.8	19.9	214 23.2	08.9	326 47.6	47.9	235 12.4	36.0	92 56.8	110	13 36.9	+103
23	130 55.1	124 36.6	21.2	229 23.8	09.0	341 50.4	48.0	250 14.8	36.0	107 26.8	110	13 47.2	+103
17 00	145 57.5	139 36.4	+ 2 22.6	244 24.5	−23 09.2	356 53.1	+13 48.1	265 17.1	−18 36.0	121 56.8	109	+13 57.5	+101
01	161 00.0	154 36.1	23.9	259 25.2	09.3	11 55.9	48.2	280 19.5	36.0	136 26.7	108	14 07.6	+101
02	176 02.5	169 35.9	25.2	274 25.9	09.4	26 58.7	48.3	295 21.8	36.0	150 56.5	107	14 17.7	+101
03	191 04.9	184 35.7	·· 26.5	289 26.6	·· 09.6	42 01.5	·· 48.5	310 24.2	·· 36.0	165 26.2	107	·14 27.8	+ 99
04	206 07.4	199 35.5	27.8	304 27.3	09.7	57 04.3	48.6	325 26.6	36.0	179 55.9	106	14 37.7	+ 99
05	221 09.9	214 35.3	29.1	319 28.0	09.8	72 07.1	48.7	340 28.9	36.1	194 25.5	105	14 47.6	+ 99
06	236 12.3	229 35.1	+ 2 30.4	334 28.6	−23 10.0	87 09.8	+13 48.8	355 31.3	−18 36.1	208 55.0	104	+14 57.5	+ 97
07	251 14.8	244 34.9	31.7	349 29.3	10.1	102 12.6	48.9	10 33.6	36.1	223 24.4	104	15 07.2	+ 97
08	266 17.2	259 34.7	33.0	4 30.0	10.2	117 15.4	49.0	25 36.0	36.1	237 53.8	103	15 16.9	+ 96
09	281 19.7	274 34.5	·· 34.3	19 30.7	·· 10.4	132 18.2	·· 49.1	40 38.4	·· 36.1	252 23.1	102	·15 26.5	+ 95
10	296 22.2	289 34.3	35.7	34 31.4	10.5	147 21.0	49.3	55 40.7	36.1	266 52.3	101	15 36.0	+ 95
11	311 24.6	304 34.1	37.0	49 32.1	10.6	162 23.8	49.4	70 43.1	36.1	281 21.4	101	15 45.5	+ 94
12	326 27.1	319 33.9	+ 2 38.3	64 32.7	−23 10.7	177 26.5	+13 49.5	85 45.4	−18 36.1	295 50.5	100	+15 54.9	+ 93
13	341 29.6	334 33.6	39.6	79 33.4	10.9	192 29.3	49.6	100 47.8	36.2	310 19.5	99	16 04.2	+ 92
14	356 32.0	349 33.4	40.9	94 34.1	11.0	207 32.1	49.7	115 50.2	36.2	324 48.4	98	16 13.4	+ 91
15	11 34.5	4 33.2	·· 42.2	109 34.8	·· 11.1	222 34.9	·· 49.8	130 52.5	·· 36.2	339 17.2	97	·16 22.5	+ 91
16	26 37.0	19 33.0	43.5	124 35.5	11.3	237 37.7	50.0	145 54.9	36.2	353 45.9	97	16 31.6	+ 90
17	41 39.4	34 32.8	44.8	139 36.2	11.4	252 40.4	50.1	160 57.2	36.2	8 14.6	96	16 40.6	+ 89
18	56 41.9	49 32.6	+ 2 46.1	154 36.8	−23 11.5	267 43.2	+13 50.2	175 59.6	−18 36.2	22 43.2	95	+16 49.5	+ 88
19	71 44.3	64 32.4	47.4	169 37.5	11.6	282 46.0	50.3	191 02.0	36.2	37 11.7	94	16 58.3	+ 87
20	86 46.8	79 32.2	48.7	184 38.2	11.8	297 48.8	50.4	206 04.3	36.2	51 40.1	94	17 07.0	+ 86
21	101 49.3	94 32.0	·· 50.1	199 38.9	·· 11.9	312 51.6	·· 50.5	221 06.7	·· 36.3	66 08.5	93	·17 15.6	+ 85
22	116 51.7	109 31.8	51.4	214 39.6	12.0	327 54.4	50.7	236 09.0	36.3	80 36.8	92	17 24.1	+ 85
23	131 54.2	124 31.6	52.7	229 40.3	12.1	342 57.1	50.8	251 11.4	36.3	95 05.0	91	17 32.6	+ 83
24	146 56.7	139 31.4	+ 2 54.0	244 41.0	−23 12.3	357 59.9	+13 50.9	266 13.8	−18 36.3	109 33.1	90	+17 40.9	+ 83
code	—	− 2	+ 13	+ 7	− 1	+ 28	+ 1	+ 24	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
15 0	176 25.7	−13 05.7	7	Acamar	315 50.9	−40 29.0
1	191 25.7	04.9	5	Achernar	335 58.9	−57 27.7
2	206 25.8	04.0	30	Acrux	173 56.9	−62 51.4
3	221 25.8	·· 03.2	19	Adhara	255 46.0	−28 54.9
4	236 25.8	02.3	10	Aldebaran	291 38.6	+16 25.4
5	251 25.8	01.5				
6	266 25.9	−13 00.6	32	Alioth	166 57.9	+56 11.5
7	281 25.9	12 59.8	34	Alkaid	153 32.4	+49 31.5
8	296 25.9	58.9	55	Al Na'ir	28 38.0	−47 10.4
9	311 25.9	·· 58.1	15	Alnilam	276 29.8	− 1 13.8
10	326 25.9	57.2	25	Alphard	218 37.9	− 8 28.3
11	341 26.0	56.4				
12	356 26.0	−12 55.5	41	Alphecca	126 47.3	+26 51.4
13	11 26.0	54.7	1	Alpheratz	358 28.3	+28 51.0
14	26 26.0	53.8	51	Altair	62 50.4	+ 8 45.0
15	41 26.1	·· 53.0	2	Ankaa	353 58.3	−42 32.8
16	56 26.1	52.1	42	Antares	113 19.0	−26 20.2
17	71 26.1	51.3				
18	86 26.1	−12 50.4	37	Arcturus	146 34.8	+19 24.3
19	101 26.2	49.5	43	Atria	108 59.6	−68 56.8
20	116 26.2	48.7	22	Avior	234 35.0	−59 22.3
21	131 26.2	·· 47.8	13	Bellatrix	279 17.9	+ 6 18.6
22	146 26.3	47.0	16	Betelg'se	271 47.6	+ 7 23.9
23	161 26.3	46.1				
			17	Canopus	264 14.9	−52 40.6
16 0	176 26.3	−12 45.3	12	Capella	281 37.8	+45 57.5
1	191 26.3	44.4	53	Deneb	50 01.2	+45 07.3
2	206 26.4	43.5	28	Denebola	183 17.1	+14 48.8
3	221 26.4	·· 42.7	4	Diphda	349 39.2	−18 13.7
4	236 26.4	41.8				
5	251 26.5	41.0	27	Dubhe	194 43.6	+61 59.0
6	266 26.5	−12 40.1	14	Elnath	279 06.8	+28 34.4
7	281 26.5	39.3	47	Eltanin	91 06.4	+51 29.4
8	296 26.6	38.4	54	Enif	34 29.6	+ 9 40.4
9	311 26.6	·· 37.5	56	Fomalhaut	16 11.6	−29 51.3
10	326 26.6	36.7				
11	341 26.6	35.8	31	Gacrux	172 48.4	−56 52.1
12	356 26.7	−12 35.0	29	Gienah	176 36.3	−17 18.1
13	11 26.7	34.1	35	Hadar	149 48.7	−60 09.6
14	26 26.7	33.2	6	Hamal	328 49.4	+23 15.4
15	41 26.8	·· 32.4	48	Kaus Aust.	84 41.0	−34 24.3
16	56 26.8	31.5				
17	71 26.8	30.6	40	Kochab	137 17.7	+74 19.7
18	86 26.9	−12 29.8	57	Markab	14 21.4	+14 58.2
19	101 26.9	28.9	8	Menkar	315 00.0	+ 3 55.1
20	116 26.9	28.1	36	Menkent	148 58.1	−36 09.3
21	131 27.0	·· 27.2	24	Miapl'dus	221 48.0	−69 32.4
22	146 27.0	26.3				
23	161 27.1	25.5	9	Mirfak	309 41.9	+49 42.6
			50	Nunki	76 51.8	−26 21.1
17 0	176 27.1	−12 24.6	52	Peacock	54 27.3	−56 52.5
1	191 27.1	23.7	21	Pollux	244 19.9	+28 07.9
2	206 27.2	22.9	20	Procyon	245 44.4	+ 5 20.1
3	221 27.2	·· 22.0				
4	236 27.2	21.1	46	R'alhague	96 46.5	+12 35.3
5	251 27.3	20.3	26	Regulus	208 28.8	+12 10.7
6	266 27.3	−12 19.4	11	Rigel	281 53.2	− 8 15.2
7	281 27.4	18.5	38	Rigil Kent.	140 50.3	−60 39.2
8	296 27.4	17.7	44	Sabik	103 01.9	−15 40.4
9	311 27.4	·· 16.8				
10	326 27.5	15.9	3	Schedar	350 30.0	+56 18.1
11	341 27.5	15.1	45	Shaula	97 20.4	−37 04.3
12	356 27.5	−12 14.2	18	Sirius	259 11.3	−16 39.5
13	11 27.6	13.3	33	Spica	159 16.4	−10 56.1
14	26 27.6	12.4	23	Suhail	223 23.6	−43 15.5
15	41 27.7	·· 11.6				
16	56 27.7	10.7	49	Vega	81 08.3	+38 44.3
17	71 27.8	09.8	39	Zub'g'bi	137 52.9	−15 51.7
18	86 27.8	−12 09.0				
19	101 27.8	08.1				
20	116 27.9	07.2				
21	131 27.9	·· 06.3				
22	146 28.0	05.5				
23	161 28.0	04.6				
24	176 28.1	−12 03.7				
Mer. Pass.	—	+ 9				

Lat.	Sunrise	Twlt. begins	Moonrise 15	16	17	18
N °	h m	h m	h m	h m	h m	h m
72	8 53	5 00	7 16	6 55	6 25	▭
70	8 33	5 05	7 24	7 12	6 57	6 31
68	8 18	5 10	7 31	7 26	7 20	7 14
66	8 05	5 13	7 37	7 37	7 39	7 43
64	7 55	5 16	7 43	7 47	7 54	8 05
62	7 46	5 18	7 47	7 55	8 06	8 22
60	7 38	5 20	7 51	8 02	8 17	8 37
58	7 31	5 21	7 54	8 09	8 26	8 50
56	7 25	5 22	7 57	8 14	8 35	9 01
54	7 20	5 23	8 00	8 19	8 42	9 10
52	7 15	5 23	8 03	8 24	8 48	9 19
50	7 11	5 24	8 05	8 28	8 54	9 27
45	7 01	5 24	8 10	8 37	9 07	9 43
40	6 53	5 23	8 14	8 44	9 18	9 57
35	6 46	5 22	8 18	8 51	9 27	10 09
30	6 40	5 20	8 21	8 57	9 35	10 19
20	6 29	5 16	8 27	9 07	9 49	10 36
10	6 20	5 09	8 32	9 16	10 02	10 52
0	6 11	5 01	8 37	9 24	10 14	11 06
10	6 02	4 50	8 42	9 32	10 25	11 21
20	5 52	4 34	8 47	9 41	10 38	11 37
30	5 40	4 15	8 53	9 52	10 52	11 55
35	5 34	4 02	8 57	9 58	11 01	12 05
40	5 26	3 45	9 00	10 05	11 11	12 17
45	5 17	3 24	9 05	10 13	11 22	12 32
50	5 07	2 54	9 11	10 23	11 36	12 49
52	5 01	2 39	9 13	10 27	11 42	12 58
54	4 56	2 20	9 16	10 32	11 50	13 07
56	4 50	1 55	9 19	10 38	11 58	13 17
58	4 43	1 18	9 23	10 44	12 07	13 30
60	4 35	////	9 27	10 51	12 17	13 44
S						

Lat.	Sunset	Twlt. ends	Moonset 15	16	17	18
N °	h m	h m	h m	h m	h m	h m
72	15 37	19 34	23 05	25 16	1 16	▭
70	15 56	19 28	22 50	24 46	0 46	3 00
68	16 12	19 24	22 38	24 24	0 24	2 18
66	16 24	19 19	22 28	24 07	0 07	1 50
64	16 35	19 17	22 19	23 53	25 29	1 29
62	16 44	19 15	22 12	23 41	25 12	1 12
60	16 51	19 12	22 06	23 31	24 58	0 58
58	16 58	19 11	22 01	23 23	24 46	0 46
56	17 04	19 09	21 56	23 15	24 35	0 35
54	17 09	19 08	21 52	23 09	24 26	0 26
52	17 14	19 08	21 48	23 03	24 18	0 18
50	17 19	19 08	21 45	22 57	24 11	0 11
45	17 28	19 07	21 37	22 46	23 55	25 04
40	17 36	19 07	21 31	22 36	23 42	24 49
35	17 43	19 08	21 26	22 28	23 31	24 36
30	17 49	19 09	21 21	22 21	23 22	24 25
20	17 59	19 13	21 13	22 08	23 06	24 05
10	18 09	19 20	21 06	21 57	22 52	23 49
0	18 18	19 28	20 59	21 47	22 38	23 33
10	18 27	19 39	20 53	21 37	22 25	23 17
20	18 36	19 53	20 46	21 26	22 11	23 00
30	18 48	20 13	20 38	21 14	21 55	22 41
35	18 54	20 25	20 33	21 07	21 46	22 30
40	19 02	20 42	20 28	20 59	21 35	22 17
45	19 10	21 02	20 22	20 50	21 23	22 02
50	19 21	21 31	20 15	20 39	21 08	21 44
52	19 26	21 46	20 11	20 34	21 01	21 35
54	19 31	22 03	20 08	20 28	20 53	21 25
56	19 37	22 27	20 04	20 22	20 44	21 14
58	19 44	23 02	19 59	20 15	20 35	21 02
60	19 52	////	19 54	20 07	20 23	20 47
S						

GMT	Equation of Time (App.—Mean) 15	16	17
h	m s	m s	m s
0	−14 17.2	−14 14.8	−14 11.7
6	−14 16.6	−14 14.1	−14 10.8
12	−14 16.1	−14 13.4	−14 09.9
18	−14 15.5	−14 12.6	−14 08.9
24	−14 14.8	−14 11.7	−14 07.9

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
15	14 48	14 41	7 44	0 21	6 25
16	15 36	14 42	7 43	0 17	6 22
17	16 26	14 42	7 42	0 12	6 18
18	17 20	14 42	7 41	0 08	6 14

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.5	0.1	0.1
30	0.5	0.1	0.1
45	0.5	0.1	0.1
60	0.5	0.1	0.0
75	0.5	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	15	16	17
°	′	′	′
0	14.9	15.7	16.3
4	14.9	15.7	16.3
8	14.9	15.7	16.3
12	14.9	15.7	16.3
16	14.9	15.7	16.3
20	15.0	15.7	16.3
24	15.0	15.7	16.3
28	15.0	15.7	16.2
32	15.0	15.7	16.2
36	15.0	15.7	16.2
40	15.0	15.7	16.2
44	15.1	15.6	16.1
48	15.1	15.6	16.1
52	15.1	15.6	16.1
56	15.1	15.6	16.0
60	15.2	15.6	16.0
64	15.2	15.6	16.0
68	15.2	15.6	15.9
72	15.3	15.6	15.9
76	15.3	15.6	15.8
80	15.3	15.6	15.8
84	15.4	15.6	15.8
88	15.4	15.6	15.7
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	15	16	17
°	′	′	′
0	15.9	15.5	15.1
4	15.9	15.5	15.1
8	15.9	15.5	15.1
12	15.9	15.5	15.1
16	15.9	15.5	15.1
20	15.9	15.5	15.2
24	15.9	15.5	15.2
28	15.8	15.5	15.2
32	15.8	15.5	15.2
36	15.8	15.5	15.2
40	15.8	15.5	15.3
44	15.8	15.5	15.3
48	15.7	15.5	15.3
52	15.7	15.5	15.4
56	15.7	15.5	15.4
60	15.6	15.5	15.4
64	15.6	15.5	15.5
68	15.6	15.5	15.5
72	15.6	15.6	15.5
76	15.5	15.6	15.6
80	15.5	15.6	15.6
84	15.4	15.6	15.7
88	15.4	15.6	15.7
90			

Subtract from table, back cover

Ash Wednesday 15

GMT	♈ GHA	VENUS −3.6 GHA	VENUS −3.6 Dec.	MARS 1.3 GHA	MARS 1.3 Dec.	JUPITER −2.1 GHA	JUPITER −2.1 Dec.	SATURN 0.7 GHA	SATURN 0.7 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
18 0	146 56.7	139 31.4	+ 2 54.0	244 41.0	−23 12.3	357 59.9	+13 50.9	266 13.8	−18 36.3	109 33.1	90	+17 40.9	+ 83
1	161 59.1	154 31.2	55.3	259 41.6	12.4	13 02.7	51.0	281 16.1	36.3	124 01.1	90	17 49.2	+ 82
2	177 01.6	169 31.0	56.6	274 42.3	12.5	28 05.5	51.1	296 18.5	36.3	138 29.1	88	17 57.4	+ 80
3	192 04.1	184 30.8	·· 57.9	289 43.0	·· 12.6	43 08.3	·· 51.2	311 20.9	·· 36.3	152 56.9	88	·18 05.4	+ 80
4	207 06.5	199 30.5	2 59.2	304 43.7	12.8	58 11.1	51.3	326 23.2	36.3	167 24.7	87	18 13.4	+ 79
5	222 09.0	214 30.3	3 00.5	319 44.4	12.9	73 13.8	51.5	341 25.6	36.3	181 52.4	87	18 21.3	+ 78
6	237 11.5	229 30.1	+ 3 01.8	334 45.1	−23 13.0	88 16.6	+13 51.6	356 27.9	−18 36.4	196 20.1	85	+18 29.1	+ 76
7	252 13.9	244 29.9	03.1	349 45.7	13.1	103 19.4	51.7	11 30.3	36.4	210 47.6	85	18 36.7	+ 76
8	267 16.4	259 29.7	04.4	4 46.4	13.2	118 22.2	51.8	26 32.7	36.4	225 15.1	84	18 44.3	+ 75
9	282 18.8	274 29.5	·· 05.7	19 47.1	·· 13.4	133 25.0	·· 51.9	41 35.0	·· 36.4	239 42.5	83	·18 51.8	+ 74
10	297 21.3	289 29.3	07.1	34 47.8	13.5	148 27.7	52.0	56 37.4	36.4	254 09.8	82	18 59.2	+ 72
11	312 23.8	304 29.1	08.4	49 48.5	13.6	163 30.5	52.2	71 39.8	36.4	268 37.0	82	19 06.4	+ 72
12	327 26.2	319 28.9	+ 3 09.7	64 49.2	−23 13.7	178 33.3	+13 52.3	86 42.1	−18 36.4	283 04.2	81	+19 13.6	+ 70
13	342 28.7	334 28.7	11.0	79 49.8	13.9	193 36.1	52.4	101 44.5	36.4	297 31.3	80	19 20.6	+ 70
14	357 31.2	349 28.5	12.3	94 50.5	14.0	208 38.9	52.5	116 46.9	36.5	311 58.3	79	19 27.6	+ 68
15	12 33.6	4 28.3	· 13.6	109 51.2	·· 14.1	223 41.7	·· 52.6	131 49.2	·· 36.5	326 25.2	78	·19 34.4	+ 67
16	27 36.1	19 28.1	14.9	124 51.9	14.2	238 44.4	52.7	146 51.6	36.5	340 52.0	78	19 41.1	+ 66
17	42 38.6	34 27.9	16.2	139 52.6	14.3	253 47.2	52.9	161 54.0	36.5	355 18.8	77	19 47.7	+ 65
18	57 41.0	49 27.7	+ 3 17.5	154 53.3	−23 14.5	268 50.0	+13 53.0	176 56.3	−18 36.5	9 45.5	76	+19 54.2	+ 64
19	72 43.5	64 27.5	18.8	169 53.9	14.6	283 52.8	53.1	191 58.7	36.5	24 12.1	75	20 00.6	+ 63
20	87 46.0	79 27.3	20.1	184 54.6	14.7	298 55.6	53.2	207 01.1	36.5	38 38.6	74	20 06.9	+ 61
21	102 48.4	94 27.1	·· 21.4	199 55.3	·· 14.8	313 58.4	·· 53.3	222 03.4	·· 36.5	53 05.0	74	·20 13.0	+ 60
22	117 50.9	109 26.9	22.7	214 56.0	14.9	329 01.1	53.4	237 05.8	36.5	67 31.4	73	20 19.0	+ 60
23	132 53.3	124 26.7	24.0	229 56.7	15.0	344 03.9	53.5	252 08.2	36.6	81 57.7	72	20 25.0	+ 58
19 0	147 55.8	139 26.5	+ 3 25.3	244 57.4	−23 15.2	359 06.7	+13 53.7	267 10.5	−18 36.6	96 23.9	72	+20 30.8	+ 56
1	162 58.3	154 26.3	26.6	259 58.0	15.3	14 09.5	53.8	282 12.9	36.6	110 50.1	71	20 36.4	+ 56
2	178 00.7	169 26.0	27.9	274 58.7	15.4	29 12.3	53.9	297 15.3	36.6	125 16.2	70	20 42.0	+ 54
3	193 03.2	184 25.8	·· 29.2	289 59.4	·· 15.5	44 15.0	·· 54.0	312 17.6	·· 36.6	139 42.2	69	·20 47.4	+ 53
4	208 05.7	199 25.6	30.6	305 00.1	15.6	59 17.8	54.1	327 20.0	36.6	154 08.1	69	20 52.7	+ 52
5	223 08.1	214 25.4	31.9	320 00.8	15.7	74 20.6	54.2	342 22.4	36.6	168 34.0	67	20 57.9	+ 50
6	238 10.6	229 25.2	+ 3 33.2	335 01.4	−23 15.9	89 23.4	+13 54.3	357 24.7	−18 36.6	182 59.7	67	+21 02.9	+ 50
7	253 13.1	244 25.0	34.5	350 02.1	16.0	104 26.2	54.5	12 27.1	36.6	197 25.4	67	21 07.9	+ 47
8	268 15.5	259 24.8	35.8	5 02.8	16.1	119 29.0	54.6	27 29.5	36.7	211 51.1	66	21 12.6	+ 47
9	283 18.0	274 24.6	·· 37.1	20 03.5	·· 16.2	134 31.7	·· 54.7	42 31.8	·· 36.7	226 16.7	65	·21 17.3	+ 45
10	298 20.5	289 24.4	38.4	35 04.2	16.3	149 34.5	54.8	57 34.2	36.7	240 42.2	64	21 21.8	+ 44
11	313 22.9	304 24.2	39.7	50 04.9	16.4	164 37.3	54.9	72 36.6	36.7	255 07.6	64	21 26.2	+ 43
12	328 25.4	319 24.0	+ 3 41.0	65 05.5	−23 16.5	179 40.1	+13 55.0	87 38.9	−18 36.7	269 33.0	63	+21 30.5	+ 42
13	343 27.8	334 23.8	42.3	80 06.2	16.7	194 42.9	55.2	102 41.3	36.7	283 58.3	62	21 34.7	+ 40
14	358 30.3	349 23.6	43.6	95 06.9	16.8	209 45.6	55.3	117 43.7	36.7	298 23.5	62	21 38.7	+ 38
15	13 32.8	4 23.4	·· 44.9	110 07.6	·· 16.9	224 48.4	·· 55.4	132 46.0	·· 36.7	312 48.7	61	·21 42.5	+ 38
16	28 35.2	19 23.2	46.2	125 08.3	17.0	239 51.2	55.5	147 48.4	36.7	327 13.8	61	21 46.3	+ 36
17	43 37.7	34 23.0	47.5	140 09.0	17.1	254 54.0	55.6	162 50.8	36.8	341 38.9	60	21 49.9	+ 34
18	58 40.2	49 22.8	+ 3 48.8	155 09.6	−23 17.2	269 56.8	+13 55.7	177 53.2	−18 36.8	356 03.9	59	+21 53.3	+ 33
19	73 42.6	64 22.6	50.1	170 10.3	17.3	284 59.6	55.8	192 55.5	36.8	10 28.8	59	21 56.6	+ 32
20	88 45.1	79 22.4	51.4	185 11.0	17.4	300 02.3	56.0	207 57.9	36.8	24 53.7	58	21 59.8	+ 30
21	103 47.6	94 22.2	·· 52.7	200 11.7	·· 17.6	315 05.1	·· 56.1	223 00.3	·· 36.8	39 18.5	57	·22 02.8	+ 29
22	118 50.0	109 22.0	54.0	215 12.4	17.7	330 07.9	56.2	238 02.6	36.8	53 43.2	58	22 05.7	+ 28
23	133 52.5	124 21.8	55.3	230 13.0	17.8	345 10.7	56.3	253 05.0	36.8	68 08.0	56	22 08.5	+ 26
20 0	148 54.9	139 21.6	+ 3 56.6	245 13.7	−23 17.9	0 13.5	+13 56.4	268 07.4	−18 36.8	82 32.6	56	+22 11.1	+ 25
1	163 57.4	154 21.4	57.9	260 14.4	18.0	15 16.2	56.5	283 09.7	36.8	96 57.2	55	22 13.6	+ 23
2	178 59.9	169 21.2	3 59.2	275 15.1	18.1	30 19.0	56.6	298 12.1	36.8	111 21.7	55	22 15.9	+ 22
3	194 02.3	184 21.0	· 4 00.5	290 15.8	·· 18.2	45 21.8	·· 56.8	313 14.5	·· 36.9	125 46.2	55	·22 18.1	+ 20
4	209 04.8	199 20.8	01.8	305 16.5	18.3	60 24.6	56.9	328 16.9	36.9	140 10.7	54	22 20.1	+ 19
5	224 07.3	214 20.6	03.1	320 17.1	18.4	75 27.4	57.0	343 19.2	36.9	154 35.1	53	22 22.0	+ 17
6	239 09.7	229 20.4	+ 4 04.4	335 17.8	−23 18.5	90 30.2	+13 57.1	358 21.6	−18 36.9	168 59.4	53	+22 23.7	+ 16
7	254 12.2	244 20.2	05.7	350 18.5	18.6	105 32.9	57.2	13 24.0	36.9	183 23.7	53	22 25.3	+ 15
8	269 14.7	259 20.0	07.0	5 19.2	18.7	120 35.7	57.3	28 26.3	36.9	197 48.0	52	22 26.8	+ 13
9	284 17.1	274 19.8	·· 08.3	20 19.9	·· 18.9	135 38.5	·· 57.4	43 28.7	·· 36.9	212 12.2	52	·22 28.1	+ 11
10	299 19.6	289 19.6	09.6	35 20.5	19.0	150 41.3	57.6	58 31.1	36.9	226 36.4	51	22 29.2	+ 10
11	314 22.1	304 19.4	10.9	50 21.2	19.1	165 44.1	57.7	73 33.5	36.9	241 00.5	51	22 30.2	+ 9
12	329 24.5	319 19.2	+ 4 12.2	65 21.9	−23 19.2	180 46.8	+13 57.8	88 35.8	−18 36.9	255 24.6	51	+22 31.1	+ 7
13	344 27.0	334 19.0	13.5	80 22.6	19.3	195 49.6	57.9	103 38.2	37.0	269 48.7	50	22 31.8	+ 5
14	359 29.4	349 18.8	14.8	95 23.3	19.4	210 52.4	58.0	118 40.6	37.0	284 12.7	50	22 32.3	+ 4
15	14 31.9	4 18.6	·· 16.1	110 23.9	·· 19.5	225 55.2	·· 58.1	133 43.0	·· 37.0	298 36.7	50	·22 32.7	+ 2
16	29 34.4	19 18.4	17.4	125 24.6	19.6	240 58.0	58.2	148 45.3	37.0	313 00.7	49	22 32.9	+ 1
17	44 36.8	34 18.2	18.7	140 25.3	19.7	256 00.7	58.4	163 47.7	37.0	327 24.6	49	22 33.0	0
18	59 39.3	49 18.0	+ 4 20.0	155 26.0	−23 19.8	271 03.5	+13 58.5	178 50.1	−18 37.0	341 48.5	49	+22 33.0	− 3
19	74 41.8	64 17.8	21.3	170 26.7	19.9	286 06.3	58.6	193 52.5	37.0	356 12.4	49	22 32.7	− 3
20	89 44.2	79 17.6	22.6	185 27.4	20.0	301 09.1	58.7	208 54.8	37.0	10 36.3	48	22 32.4	− 6
21	104 46.7	94 17.4	·· 23.9	200 28.0	·· 20.1	316 11.9	·· 58.8	223 57.2	·· 37.0	25 00.1	48	22 31.8	− 6
22	119 49.2	109 17.2	25.2	215 28.7	20.2	331 14.7	58.9	238 59.6	37.0	39 23.9	48	22 31.2	− 9
23	134 51.6	124 17.0	26.5	230 29.4	20.3	346 17.4	59.0	254 02.0	37.1	53 47.7	47	22 30.3	− 10
24	149 54.1	139 16.8	+ 4 27.8	245 30.1	−23 20.4	1 20.2	+13 59.2	269 04.3	−18 37.1	68 11.4	48	+22 29.3	− 11
code	—	− 2	+ 13	+ 7	− 2	+ 28	+ 2	+ 24	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
18 00	176 28.1	−12 03.7	7	Acamar	315 51.0	−40 29.0
01	191 28.1	02.9	5	Achernar	335 58.9	−57 27.7
02	206 28.1	02.0	30	Acrux	173 56.9	−62 51.4
03	221 28.2	·· 01.1	19	Adhara	255 46.0	−28 54.9
04	236 28.2	12 00.2	10	Aldebaran	291 38.6	+16 25.3
05	251 28.3	11 59.4				
06	266 28.3	−11 58.5	32	Alioth	166 57.8	+56 11.5
07	281 28.4	57.6	34	Alkaid	153 32.4	+49 31.5
08	296 28.4	56.7	55	Al Na'ir	28 38.0	−47 10.4
09	311 28.5	·· 55.9	15	Alnilam	276 29.8	− 1 13.8
10	326 28.5	55.0	25	Alphard	218 37.9	− 8 28.3
11	341 28.6	54.1				
12	356 28.6	−11 53.2	41	Alphecca	126 47.3	+26 51.4
13	11 28.7	52.3	1	Alpheratz	358 28.3	+28 51.0
14	26 28.7	51.5	51	Altair	62 50.4	+ 8 45.0
15	41 28.7	·· 50.6	2	Ankaa	353 58.3	−42 32.7
16	56 28.8	49.7	42	Antares	113 19.0	−26 20.2
17	71 28.8	48.8				
18	86 28.9	−11 48.0	37	Arcturus	146 34.7	+19 24.3
19	101 28.9	47.1	43	Atria	108 59.6	−68 56.8
20	116 29.0	46.2	22	Avior	234 35.1	−59 22.3
21	131 29.0	·· 45.3	13	Bellatrix	279 17.9	+ 6 18.6
22	146 29.1	44.4	16	Betelg'se	271 47.6	+ 7 23.9
23	161 29.1	43.6				
			17	Canopus	264 14.9	−52 40.6
19 00	176 29.2	−11 42.7	12	Capella	281 37.8	+45 57.5
01	191 29.2	41.8	53	Deneb	50 01.2	+45 07.3
02	206 29.3	40.9	28	Denebola	183 17.1	+14 48.8
03	221 29.4	·· 40.0	4	Diphda	349 39.2	−18 13.7
04	236 29.4	39.1				
05	251 29.5	38.3	27	Dubhe	194 43.5	+61 59.0
06	266 29.5	−11 37.4	14	Elnath	279 06.8	+28 34.4
07	281 29.6	36.5	47	Eltanin	91 06.4	+51 29.4
08	296 29.6	35.6	54	Enif	34 29.6	+ 9 40.4
09	311 29.7	·· 34.7	56	Fomalhaut	16 11.6	−29 51.3
10	326 29.7	33.8				
11	341 29.8	33.0	31	Gacrux	172 48.4	−56 52.1
12	356 29.8	−11 32.1	29	Gienah	176 36.2	−17 18.1
13	11 29.9	31.2	35	Hadar	149 48.6	−60 09.6
14	26 29.9	30.3	6	Hamal	328 49.4	+23 15.4
15	41 30.0	·· 29.4	48	Kaus Aust.	84 41.0	−34 24.3
16	56 30.1	28.5				
17	71 30.1	27.6	40	Kochab	137 17.6	+74 19.7
18	86 30.2	−11 26.8	57	Markab	14 21.4	+14 58.2
19	101 30.2	25.9	8	Menkar	315 00.0	+ 3 55.1
20	116 30.3	25.0	36	Menkent	148 58.1	−36 09.3
21	131 30.3	·· 24.1	24	Miapl'dus	221 48.0	−69 32.4
22	146 30.4	23.2				
23	161 30.5	22.3	9	Mirfak	309 42.0	+49 42.6
			50	Nunki	76 51.7	−26 21.1
20 00	176 30.5	−11 21.4	52	Peacock	54 27.3	−56 52.5
01	191 30.6	20.5	21	Pollux	244 19.9	+28 07.9
02	206 30.6	19.7	20	Procyon	245 44.4	+ 5 20.1
03	221 30.7	·· 18.8				
04	236 30.8	17.9	46	R'alhague	96 46.4	+12 35.3
05	251 30.8	17.0	26	Regulus	208 28.8	+12 10.7
06	266 30.9	−11 16.1	11	Rigel	281 53.2	− 8 15.2
07	281 30.9	15.2	38	Rigil Kent.	140 50.3	−60 39.2
08	296 31.0	14.3	44	Sabik	103 01.9	−15 40.4
09	311 31.1	·· 13.4				
10	326 31.1	12.5	3	Schedar	350 30.0	+56 18.1
11	341 31.2	11.6	45	Shaula	97 20.4	−37 04.3
12	356 31.2	−11 10.8	18	Sirius	259 11.3	−16 39.5
13	11 31.3	09.9	33	Spica	159 16.3	−10 56.1
14	26 31.4	09.0	23	Suhail	223 23.6	−43 15.5
15	41 31.4	·· 08.1				
16	56 31.5	07.2	49	Vega	81 08.3	+38 44.3
17	71 31.6	06.3	39	Zub'g'bi	137 52.9	−15 51.7
18	86 31.6	−11 05.4				
19	101 31.7	04.5				
20	116 31.7	03.6				
21	131 31.8	·· 02.7				
22	146 31.9	01.8				
23	161 31.9	00.9				
24	176 32.0	−11 00.0				
code	—	+ 9				

GMT	Equation of Time (App. − Mean) 18	19	20
h	m s	m s	m s
0	−14 07.9	−14 03.3	−13 58.1
6	−14 06.8	−14 02.1	−13 56.6
12	−14 05.7	−14 00.8	−13 55.2
18	−14 04.5	−13 59.4	−13 53.7
24	−14 03.3	−13 58.1	−13 52.1

Lat.	Sunrise	Twlt. begins	Moonrise 18	19	20	21
N °	h m	h m	h m	h m	h m	h m
72	8 36	4 46	□	□	□	□
70	8 19	4 53	6 31	□	□	□
68	8 05	4 59	7 14	7 04	□	□
66	7 54	5 04	7 43	7 53	8 21	9 28
64	7 45	5 07	8 05	8 24	9 02	10 08
62	7 37	5 10	8 22	8 48	9 30	10 35
60	7 30	5 13	8 37	9 07	9 52	10 56
58	7 24	5 14	8 50	9 23	10 10	11 14
56	7 18	5 16	9 01	9 36	10 25	11 28
54	7 13	5 17	9 10	9 48	10 37	11 41
52	7 09	5 18	9 19	9 58	10 49	11 52
50	7 05	5 19	9 27	10 07	10 59	12 02
45	6 56	5 20	9 43	10 27	11 20	12 23
40	6 49	5 19	9 57	10 43	11 37	12 39
35	6 43	5 19	10 09	10 56	11 51	12 53
30	6 37	5 18	10 19	11 08	12 04	13 06
20	6 27	5 14	10 36	11 28	12 25	13 27
10	6 19	5 08	10 52	11 46	12 44	13 45
0	6 11	5 01	11 06	12 02	13 02	14 02
10	6 02	4 50	11 21	12 19	13 19	14 19
20	5 53	4 37	11 37	12 37	13 38	14 37
30	5 43	4 18	11 55	12 58	13 59	14 58
35	5 37	4 06	12 05	13 10	14 12	15 10
40	5 30	3 50	12 17	13 24	14 27	15 24
45	5 22	3 30	12 32	13 40	14 44	15 41
50	5 12	3 03	12 49	14 00	15 06	16 02
52	5 07	2 49	12 58	14 10	15 16	16 11
54	5 02	2 31	13 07	14 21	15 27	16 22
56	4 57	2 11	13 17	14 34	15 41	16 35
58	4 50	1 41	13 30	14 48	15 56	16 49
60	4 43	0 46	13 44	15 05	16 14	17 06
S						

Lat.	Sunset	Twlt. ends	Moonset 18	19	20	21
N °	h m	h m	h m	h m	h m	h m
72	15 53	19 48	□	□	□	□
70	16 11	19 41	3 00	□	□	□
68	16 24	19 34	2 18	4 24	□	□
66	16 35	19 29	1 50	3 35	5 08	6 07
64	16 44	19 25	1 29	3 04	4 28	5 28
62	16 52	19 22	1 12	2 40	4 00	5 00
60	16 59	19 19	0 58	2 22	3 38	4 39
58	17 05	19 17	0 46	2 07	3 20	4 21
56	17 11	19 16	0 35	1 53	3 06	4 06
54	17 15	19 14	0 26	1 42	2 53	3 53
52	17 20	19 13	0 18	1 32	2 42	3 42
50	17 24	19 12	0 11	1 23	2 32	3 32
45	17 32	19 10	25 04	1 04	2 11	3 11
40	17 39	19 10	24 49	0 49	1 54	2 54
35	17 46	19 11	24 36	0 36	1 39	2 40
30	17 51	19 11	24 25	0 25	1 27	2 28
20	18 01	19 15	24 05	0 05	1 06	2 06
10	18 09	19 20	23 49	24 48	0 48	1 48
0	18 17	19 27	23 33	24 30	0 30	1 30
10	18 26	19 38	23 17	24 13	0 13	1 13
20	18 34	19 50	23 00	23 55	24 54	0 54
30	18 45	20 09	22 41	23 34	24 32	0 32
35	18 51	20 21	22 30	23 21	24 20	0 20
40	18 57	20 35	22 17	23 07	24 05	0 05
45	19 05	20 55	22 02	22 50	23 48	24 55
50	19 15	21 22	21 44	22 29	23 26	24 35
52	19 19	21 35	21 35	22 19	23 16	24 25
54	19 24	21 51	21 25	22 08	23 05	24 15
56	19 30	22 12	21 14	21 55	22 51	24 03
58	19 36	22 39	21 02	21 41	22 36	23 48
60	19 43	23 26	20 47	21 23	22 18	23 32
S						

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
18	17 20	14 42	7 41	0 08	6 14
19	18 16	14 42	7 40	[0 04 / 23 59]	6 10
20	19 16	14 43	7 39	23 55	6 07
21	20 16	14 43	7 38	23 50	6 03

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.5	0.1	0.1
30	0.5	0.1	0.1
45	0.5	0.1	0.1
60	0.5	0.1	0.0
75	0.5	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	18	19	20
°	′	′	′
0	17.1	17.8	18.5
4	17.1	17.8	18.5
8	17.1	17.8	18.4
12	17.0	17.8	18.4
16	17.0	17.8	18.4
20	17.0	17.7	18.3
24	17.0	17.7	18.2
28	16.9	17.6	18.2
32	16.9	17.5	18.1
36	16.8	17.5	18.0
40	16.8	17.4	17.9
44	16.7	17.3	17.8
48	16.6	17.2	17.7
52	16.6	17.1	17.5
56	16.5	17.0	17.4
60	16.4	16.9	17.3
64	16.4	16.8	17.1
68	16.3	16.7	17.0
72	16.2	16.5	16.8
76	16.1	16.4	16.7
80	16.0	16.3	16.5
84	16.0	16.2	16.3
88	15.9	16.1	16.2
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	18	19	20
°	′	′	′
0	14.7	14.2	13.9
4	14.7	14.3	13.9
8	14.7	14.3	13.9
12	14.7	14.3	13.9
16	14.7	14.3	14.0
20	14.8	14.4	14.0
24	14.8	14.4	14.1
28	14.8	14.5	14.2
32	14.9	14.5	14.3
36	14.9	14.6	14.4
40	15.0	14.7	14.5
44	15.0	14.8	14.6
48	15.1	14.9	14.7
52	15.2	15.0	14.8
56	15.2	15.1	15.0
60	15.3	15.2	15.1
64	15.4	15.3	15.2
68	15.5	15.4	15.4
72	15.5	15.5	15.5
76	15.6	15.7	15.7
80	15.7	15.8	15.9
84	15.8	15.9	16.0
88	15.9	16.0	16.1
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.6 GHA	VENUS −3.6 Dec.	MARS 1.3 GHA	MARS 1.3 Dec.	JUPITER −2.1 GHA	JUPITER −2.1 Dec.	SATURN 0.7 GHA	SATURN 0.7 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
21 0	149 54.1	139 16.8	+ 4 27.8	245 30.1	−23 20.4	1 20.2	+13 59.2	269 04.3	−18 37.1	68 11.4	48	+22 29.3	− 11
1	164 56.6	154 16.6	29.1	260 30.8	20.5	16 23.0	59.3	284 06.7	37.1	82 35.2	47	22 28.2	− 13
2	179 59.0	169 16.4	30.4	275 31.4	20.6	31 25.8	59.4	299 09.1	37.1	96 58.9	47	22 26.9	− 15
3	195 01.5	184 16.2	·· 31.7	290 32.1	·· 20.7	46 28.6	·· 59.5	314 11.5	·· 37.1	111 22.6	47	·22 25.4	− 16
4	210 03.9	199 16.0	33.0	305 32.8	20.8	61 31.3	59.6	329 13.8	37.1	125 46.3	47	22 23.8	− 17
5	225 06.4	214 15.8	34.3	320 33.5	20.9	76 34.1	59.7	344 16.2	37.1	140 10.0	47	22 22.1	− 20
6	240 08.9	229 15.6	+ 4 35.6	335 34.2	−23 21.0	91 36.9	+13 59.8	359 18.6	−18 37.1	154 33.7	47	+22 20.1	− 20
7	255 11.3	244 15.4	36.9	350 34.8	21.1	106 39.7	14 00.0	14 21.0	37.1	168 57.4	47	22 18.1	− 23
8	270 13.8	259 15.2	38.2	5 35.5	21.2	121 42.5	00.1	29 23.3	37.1	183 21.1	46	22 15.8	− 23
9	285 16.3	274 15.0	·· 39.5	20 36.2	·· 21.3	136 45.2	·· 00.2	44 25.7	·· 37.2	197 44.7	47	·22 13.5	− 26
10	300 18.7	289 14.8	40.8	35 36.9	21.4	151 48.0	00.3	59 28.1	37.2	212 08.4	46	22 10.9	− 27
11	315 21.2	304 14.6	42.1	50 37.6	21.5	166 50.8	00.4	74 30.5	37.2	226 32.0	47	22 08.2	− 28
12	330 23.7	319 14.4	+ 4 43.4	65 38.2	−23 21.6	181 53.6	+14 00.5	89 32.8	−18 37.2	240 55.7	47	+22 05.4	− 30
13	345 26.1	334 14.2	44.7	80 38.9	21.7	196 56.4	00.6	104 35.2	37.2	255 19.4	46	22 02.4	− 32
14	0 28.6	349 14.0	46.0	95 39.6	21.8	211 59.1	00.7	119 37.6	37.2	269 43.0	47	21 59.2	− 33
15	15 31.0	4 13.8	·· 47.3	110 40.3	·· 21.9	227 01.9	·· 00.9	134 40.0	·· 37.2	284 06.7	47	·21 55.9	− 35
16	30 33.5	19 13.6	48.6	125 41.0	22.0	242 04.7	01.0	149 42.3	37.2	298 30.4	46	21 52.4	− 36
17	45 36.0	34 13.4	49.9	140 41.6	22.1	257 07.5	01.1	164 44.7	37.2	312 54.0	47	21 48.8	− 37
18	60 38.4	49 13.2	+ 4 51.2	155 42.3	−23 22.2	272 10.3	+14 01.2	179 47.1	−18 37.2	327 17.7	47	+21 45.1	− 40
19	75 40.9	64 13.0	52.5	170 43.0	22.3	287 13.0	01.3	194 49.5	37.2	341 41.4	48	21 41.1	− 40
20	90 43.4	79 12.8	53.7	185 43.7	22.4	302 15.8	01.4	209 51.9	37.3	356 05.2	47	21 37.1	− 43
21	105 45.8	94 12.6	·· 55.0	200 44.4	·· 22.5	317 18.6	·· 01.5	224 54.2	·· 37.3	10 28.9	47	·21 32.8	− 43
22	120 48.3	109 12.4	56.3	215 45.0	22.6	332 21.4	01.7	239 56.6	37.3	24 52.6	48	21 28.5	− 46
23	135 50.8	124 12.2	57.6	230 45.7	22.7	347 24.2	01.8	254 59.0	37.3	39 16.4	48	21 23.9	− 46
22 0	150 53.2	139 12.0	+ 4 58.9	245 46.4	−23 22.8	2 26.9	+14 01.9	270 01.4	−18 37.3	53 40.2	48	+21 19.3	− 49
1	165 55.7	154 11.8	5 00.2	260 47.1	22.9	17 29.7	02.0	285 03.8	37.3	68 04.0	48	21 14.4	− 49
2	180 58.2	169 11.6	01.5	275 47.8	23.0	32 32.5	02.1	300 06.1	37.3	82 27.8	49	21 09.5	− 52
3	196 00.6	184 11.4	·· 02.8	290 48.4	·· 23.0	47 35.3	·· 02.2	315 08.5	·· 37.3	96 51.7	48	·21 04.3	− 52
4	211 03.1	199 11.2	04.1	305 49.1	23.1	62 38.1	02.3	330 10.9	37.3	111 15.5	49	20 59.1	− 55
5	226 05.5	214 11.0	05.4	320 49.8	23.2	77 40.8	02.4	345 13.3	37.3	125 39.4	50	20 53.6	− 55
6	241 08.0	229 10.8	+ 5 06.7	335 50.5	−23 23.3	92 43.6	+14 02.6	0 15.7	−18 37.3	140 03.4	49	+20 48.1	− 57
7	256 10.5	244 10.6	08.0	350 51.2	23.4	107 46.4	02.7	15 18.0	37.3	154 27.3	50	20 42.4	− 59
8	271 12.9	259 10.4	09.3	5 51.8	23.5	122 49.2	02.8	30 20.4	37.4	168 51.3	50	20 36.5	− 60
9	286 15.4	274 10.2	·· 10.6	20 52.5	·· 23.6	137 51.9	·· 02.9	45 22.8	·· 37.4	183 15.3	51	·20 30.5	− 61
10	301 17.9	289 10.0	11.9	35 53.2	23.7	152 54.7	03.0	60 25.2	37.4	197 39.4	50	20 24.4	− 63
11	316 20.3	304 09.8	13.1	50 53.9	23.8	167 57.5	03.1	75 27.6	37.4	212 03.4	52	20 18.1	− 65
12	331 22.8	319 09.6	+ 5 14.4	65 54.6	−23 23.9	183 00.3	+14 03.2	90 29.9	−18 37.4	226 27.6	51	+20 11.6	− 65
13	346 25.3	334 09.4	15.7	80 55.2	24.0	198 03.1	03.3	105 32.3	37.4	240 51.7	52	20 05.1	− 68
14	1 27.7	349 09.2	17.0	95 55.9	24.1	213 05.8	03.5	120 34.7	37.4	255 15.9	52	19 58.3	− 68
15	16 30.2	4 09.0	·· 18.3	110 56.6	·· 24.1	228 08.6	·· 03.6	135 37.1	·· 37.4	269 40.1	53	·19 51.5	− 70
16	31 32.6	19 08.8	19.6	125 57.3	24.2	243 11.4	03.7	150 39.5	37.4	284 04.4	53	19 44.5	− 71
17	46 35.1	34 08.6	20.9	140 58.0	24.3	258 14.2	03.8	165 41.9	37.4	298 28.7	54	19 37.4	− 73
18	61 37.6	49 08.4	+ 5 22.2	155 58.6	−23 24.4	273 17.0	+14 03.9	180 44.2	−18 37.4	312 53.1	54	+19 30.1	− 74
19	76 40.0	64 08.2	23.5	170 59.3	24.5	288 19.7	04.0	195 46.6	37.4	327 17.5	54	19 22.7	− 75
20	91 42.5	79 08.0	24.8	186 00.0	24.6	303 22.5	04.1	210 49.0	37.5	341 41.9	55	19 15.2	− 77
21	106 45.0	94 07.8	·· 26.1	201 00.7	·· 24.7	318 25.3	·· 04.2	225 51.4	·· 37.5	356 06.4	55	·19 07.5	− 78
22	121 47.4	109 07.6	27.3	216 01.4	24.8	333 28.1	04.4	240 53.8	37.5	10 30.9	56	18 59.7	− 79
23	136 49.9	124 07.4	28.6	231 02.0	24.8	348 30.8	04.5	255 56.1	37.5	24 55.5	56	18 51.8	− 81
23 0	151 52.4	139 07.2	+ 5 29.9	246 02.7	−23 24.9	3 33.6	+14 04.6	270 58.5	−18 37.5	39 20.1	57	+18 43.7	− 81
1	166 54.8	154 07.0	31.2	261 03.4	25.0	18 36.4	04.7	286 00.9	37.5	53 44.8	57	18 35.6	− 84
2	181 57.3	169 06.8	32.5	276 04.1	25.1	33 39.2	04.8	301 03.3	37.5	68 09.5	58	18 27.2	− 84
3	196 59.8	184 06.6	·· 33.8	291 04.7	·· 25.2	48 42.0	·· 04.9	316 05.7	·· 37.5	82 34.3	58	·18 18.8	− 86
4	212 02.2	199 06.4	35.1	306 05.4	25.3	63 44.7	05.0	331 08.1	37.5	96 59.1	59	18 10.2	− 86
5	227 04.7	214 06.3	36.4	321 06.1	25.4	78 47.5	05.1	346 10.5	37.5	111 24.0	60	18 01.6	− 89
6	242 07.1	229 06.1	+ 5 37.7	336 06.8	−23 25.4	93 50.3	+14 05.3	1 12.8	−18 37.5	125 49.0	60	+17 52.7	− 89
7	257 09.6	244 05.9	38.9	351 07.5	25.5	108 53.1	05.4	16 15.2	37.5	140 14.0	60	17 43.8	− 90
8	272 12.1	259 05.7	40.2	6 08.1	25.6	123 55.8	05.5	31 17.6	37.5	154 39.0	61	17 34.8	− 92
9	287 14.5	274 05.5	·· 41.5	21 08.8	·· 25.7	138 58.6	·· 05.6	46 20.0	·· 37.6	169 04.1	61	·17 25.6	− 93
10	302 17.0	289 05.3	42.8	36 09.5	25.8	154 01.4	05.7	61 22.4	37.6	183 29.2	63	17 16.3	− 94
11	317 19.5	304 05.1	44.1	51 10.2	25.9	169 04.2	05.8	76 24.8	37.6	197 54.5	62	17 06.9	− 95
12	332 21.9	319 04.9	+ 5 45.4	66 10.9	−23 25.9	184 07.0	+14 05.9	91 27.1	−18 37.6	212 19.7	63	+16 57.4	− 97
13	347 24.4	334 04.7	46.7	81 11.5	26.0	199 09.7	06.0	106 29.5	37.6	226 45.0	64	16 47.7	− 97
14	2 26.9	349 04.5	47.9	96 12.2	26.1	214 12.5	06.1	121 31.9	37.6	241 10.4	65	16 38.0	− 99
15	17 29.3	4 04.3	·· 49.2	111 12.9	·· 26.2	229 15.3	·· 06.3	136 34.3	·· 37.6	255 35.9	65	·16 28.1	− 99
16	32 31.8	19 04.1	50.5	126 13.6	26.3	244 18.1	06.4	151 36.7	37.6	270 01.4	65	16 18.2	−101
17	47 34.3	34 03.9	51.8	141 14.3	26.4	259 20.8	06.5	166 39.1	37.6	284 26.9	66	16 08.1	−102
18	62 36.7	49 03.7	+ 5 53.1	156 14.9	−23 26.4	274 23.6	+14 06.6	181 41.5	−18 37.6	298 52.5	67	+15 57.9	−102
19	77 39.2	64 03.5	54.4	171 15.6	26.5	289 26.4	06.7	196 43.9	37.6	313 18.2	67	15 47.7	−104
20	92 41.6	79 03.3	55.7	186 16.3	26.6	304 29.2	06.8	211 46.2	37.6	327 43.9	68	15 37.3	−105
21	107 44.1	94 03.1	·· 56.9	201 17.0	·· 26.7	319 32.0	·· 06.9	226 48.6	·· 37.6	342 09.7	69	·15 26.8	−106
22	122 46.6	109 02.9	58.2	216 17.6	26.8	334 34.7	07.0	241 51.0	37.7	356 35.6	69	15 16.2	−107
23	137 49.0	124 02.7	5 59.5	231 18.3	26.8	349 37.5	07.2	256 53.4	37.7	11 01.5	70	15 05.5	−108
24	152 51.5	139 02.5	+ 6 00.8	246 19.0	−23 26.9	4 40.3	+14 07.3	271 55.8	−18 37.7	25 27.5	70	+14 54.7	−108
code	−	− 2	+ 13	+ 6	− 1	+ 28	+ 1	+ 24	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
21 0	176 32.0	−11 00.0	7	Acamar	315 51.0	−40 29.0
1	191 32.1	10 59.1	5	Achernar	335 59.0	−57 27.7
2	206 32.1	58.2	30	Acrux	173 56.8	−62 51.4
3	221 32.2	·· 57.3	19	Adhara	255 46.0	−28 55.0
4	236 32.3	56.4	10	Aldebaran	291 38.6	+16 25.3
5	251 32.3	55.5				
6	266 32.4	−10 54.6	32	Alioth	166 57.8	+56 11.5
7	281 32.5	53.7	34	Alkaid	153 32.3	+49 31.5
8	296 32.5	52.8	55	Al Na'ir	28 38.0	−47 10.4
9	311 32.6	·· 51.9	15	Alnilam	276 29.8	− 1 13.9
10	326 32.7	51.0	25	Alphard	218 37.9	− 8 28.3
11	341 32.7	50.2				
12	356 32.8	−10 49.3	41	Alphecca	126 47.3	+26 51.4
13	11 32.9	48.4	1	Alpheratz	358 28.3	+28 51.0
14	26 33.0	47.5	51	Altair	62 50.4	+ 8 45.0
15	41 33.0	·· 46.6	2	Ankaa	353 58.3	−42 32.7
16	56 33.1	45.7	42	Antares	113 19.0	−26 20.2
17	71 33.2	44.8				
18	86 33.2	−10 43.9	37	Arcturus	146 34.7	+19 24.3
19	101 33.3	42.9	43	Atria	108 59.5	−68 56.8
20	116 33.4	42.0	22	Avior	234 35.1	−59 22.3
21	131 33.4	·· 41.1	13	Bellatrix	279 18.0	+ 6 18.6
22	146 33.5	40.2	16	Betelg'se	271 47.6	+ 7 23.9
23	161 33.6	39.3				
			17	Canopus	264 14.9	−52 40.6
22 0	176 33.7	−10 38.4	12	Capella	281 37.8	+45 57.5
1	191 33.7	37.5	53	Deneb	50 01.2	+45 07.3
2	206 33.8	36.6	28	Denebola	183 17.1	+14 48.8
3	221 33.9	·· 35.7	4	Diphda	349 39.2	−18 13.7
4	236 34.0	34.8				
5	251 34.0	33.9	27	Dubhe	194 43.5	+61 59.0
6	266 34.1	−10 33.0	14	Elnath	279 06.8	+28 34.4
7	281 34.2	32.1	47	Eltanin	91 06.3	+51 29.3
8	296 34.3	31.2	54	Enif	34 29.6	+ 9 40.4
9	311 34.3	·· 30.3	56	Fomalhaut	16 11.6	−29 51.3
10	326 34.4	29.4				
11	341 34.5	28.5	31	Gacrux	172 48.4	−56 52.1
12	356 34.6	−10 27.6	29	Gienah	176 36.2	−17 18.1
13	11 34.6	26.7	35	Hadar	149 48.6	−60 09.7
14	26 34.7	25.8	6	Hamal	328 49.4	+23 15.4
15	41 34.8	·· 24.9	48	Kaus Aust.	84 40.9	−34 24.3
16	56 34.9	24.0				
17	71 34.9	23.1	40	Kochab	137 17.6	+74 19.7
18	86 35.0	−10 22.1	57	Markab	14 21.4	+14 58.2
19	101 35.1	21.2	8	Menkar	315 00.1	+ 3 55.1
20	116 35.2	20.3	36	Menkent	148 58.1	−36 09.3
21	131 35.3	·· 19.4	24	Miapl'dus	221 48.1	−69 32.4
22	146 35.3	18.5				
23	161 35.4	17.6	9	Mirfak	309 42.0	+49 42.6
			50	Nunki	76 51.7	−26 21.1
23 0	176 35.5	−10 16.7	52	Peacock	54 27.3	−56 52.5
1	191 35.6	15.8	21	Pollux	244 19.9	+28 07.9
2	206 35.7	14.9	20	Procyon	245 44.4	+ 5 20.1
3	221 35.7	·· 14.0				
4	236 35.8	13.1	46	R'alhague	96 46.4	+12 35.3
5	251 35.9	12.1	26	Regulus	208 28.8	+12 10.7
6	266 36.0	−10 11.2	11	Rigel	281 53.2	− 8 15.2
7	281 36.1	10.3	38	Rigil Kent.	140 50.2	−60 39.2
8	296 36.1	09.4	44	Sabik	103 01.9	−15 40.4
9	311 36.2	·· 08.5				
10	326 36.3	07.6	3	Schedar	350 30.0	+56 18.0
11	341 36.4	06.7	45	Shaula	97 20.4	−37 04.3
12	356 36.5	−10 05.8	18	Sirius	259 11.4	−16 39.5
13	11 36.6	04.8	33	Spica	159 16.3	−10 56.1
14	26 36.6	03.9	23	Suhail	223 23.7	−43 15.5
15	41 36.7	·· 03.0				
16	56 36.8	02.1	49	Vega	81 08.3	+38 44.3
17	71 36.9	01.2	39	Zub'g'bi	137 52.9	−15 51.7
18	86 37.0	−10 00.3				
19	101 37.1	9 59.4				
20	116 37.1	58.5				
21	131 37.2	·· 57.5				
22	146 37.3	56.6				
23	161 37.4	55.7				
24	176 37.5	− 9 54.8				
code	−	+ 9				

GMT	Equation of Time (App. − Mean) 21	22	23
h	m s	m s	m s
0	−13 52.1	−13 45.5	−13 38.2
6	−13 50.5	−13 43.7	−13 36.3
12	−13 48.9	−13 41.9	−13 34.3
18	−13 47.2	−13 40.1	−13 32.3
24	−13 45.5	−13 38.2	−13 30.2

Lat.	Sunrise	Twlt. begins	Moonrise 21	22	23	24
N °	h m	h m	h m	h m	h m	h m
72	8 20	4 32	▭	▭	11 10	14 05
70	8 05	4 40	▭	▭	12 07	14 28
68	7 53	4 48	▭	10 28	12 41	14 45
66	7 43	4 54	9 28	11 11	13 05	14 59
64	7 35	4 58	10 08	11 40	13 24	15 10
62	7 28	5 02	10 35	12 01	13 39	15 20
60	7 22	5 04	10 56	12 19	13 52	15 28
58	7 16	5 07	11 14	12 34	14 03	15 35
56	7 11	5 09	11 28	12 46	14 12	15 42
54	7 07	5 11	11 41	12 57	14 21	15 47
52	7 03	5 12	11 52	13 07	14 28	15 52
50	6 59	5 13	12 02	13 15	14 35	15 57
45	6 52	5 15	12 23	13 34	14 49	16 07
40	6 45	5 16	12 39	13 48	15 01	16 15
35	6 39	5 16	12 53	14 01	15 11	16 22
30	6 34	5 15	13 06	14 12	15 20	16 28
20	6 26	5 12	13 27	14 31	15 35	16 39
10	6 18	5 07	13 45	14 47	15 48	16 48
0	6 10	5 00	14 02	15 02	16 01	16 57
10	6 03	4 52	14 19	15 17	16 13	17 05
20	5 55	4 38	14 37	15 34	16 26	17 15
30	5 45	4 20	14 58	15 52	16 41	17 25
35	5 40	4 09	15 10	16 03	16 50	17 31
40	5 33	3 54	15 24	16 15	16 59	17 38
45	5 26	3 35	15 41	16 30	17 11	17 46
50	5 17	3 10	16 02	16 48	17 25	17 55
52	5 13	2 58	16 11	16 56	17 31	18 00
54	5 08	2 42	16 22	17 05	17 38	18 04
56	5 03	2 23	16 35	17 16	17 46	18 10
58	4 57	1 58	16 49	17 28	17 55	18 15
60	4 51	1 20	17 06	17 41	18 05	18 22
S						C

Lat.	Sunset	Twlt. ends	Moonset 21	22	23	24
N °	h m	h m	h m	h m	h m	h m
72	16 10	20 02	▭	▭	8 38	7 42
70	16 24	19 52	▭	▭	7 40	7 18
68	16 36	19 45	▭	7 14	7 05	6 59
66	16 46	19 39	6 07	6 31	6 40	6 44
64	16 54	19 34	5 28	6 02	6 20	6 31
62	17 01	19 30	5 00	5 40	6 04	6 20
60	17 07	19 27	4 39	5 22	5 51	6 11
58	17 12	19 23	4 21	5 06	5 39	6 03
56	17 17	19 21	4 06	4 54	5 29	5 56
54	17 21	19 19	3 53	4 42	5 20	5 49
52	17 25	19 18	3 42	4 32	5 12	5 44
50	17 29	19 17	3 32	4 23	5 05	5 38
45	17 36	19 14	3 11	4 04	4 49	5 27
40	17 43	19 13	2 54	3 49	4 36	5 17
35	17 48	19 13	2 40	3 36	4 25	5 09
30	17 53	19 13	2 28	3 24	4 16	5 02
20	18 02	19 16	2 06	3 04	3 59	4 49
10	18 10	19 21	1 48	2 47	3 44	4 38
0	18 17	19 27	1 30	2 31	3 30	4 28
10	18 24	19 35	1 13	2 14	3 16	4 17
20	18 33	19 49	0 54	1 57	3 01	4 06
30	18 42	20 05	0 32	1 37	2 44	3 53
35	18 47	20 16	0 20	1 25	2 34	3 45
40	18 53	20 30	0 05	1 11	2 22	3 36
45	19 01	20 49	24 55	0 55	2 09	3 26
50	19 09	21 13	24 35	0 35	1 52	3 14
52	19 13	21 25	24 25	0 25	1 44	3 08
54	19 18	21 41	24 15	0 15	1 35	3 01
56	19 23	21 59	24 03	0 03	1 25	2 54
58	19 28	22 22	23 48	25 14	1 14	2 46
60	19 35	22 57	23 32	25 01	1 01	2 37
S						

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
21	20 16	14 43	7 38	23 50	6 03
22	21 16	14 43	7 37	23 46	5 59
23	22 14	14 44	7 36	23 41	5 55
24	23 10	14 44	7 34	23 37	5 51

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.5	0.1	0.1
30	0.5	0.1	0.1
45	0.5	0.1	0.1
60	0.5	0.1	0.0
75	0.5	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	21	22	23
°	′	′	′
0	19.1	19.5	19.7
4	19.1	19.5	19.7
8	19.1	19.5	19.7
12	19.0	19.4	19.7
16	19.0	19.3	19.6
20	18.9	19.3	19.5
24	18.8	19.2	19.4
28	18.7	19.1	19.3
32	18.6	19.0	19.2
36	18.5	18.8	19.1
40	18.4	18.7	18.9
44	18.3	18.5	18.7
48	18.1	18.4	18.6
52	18.0	18.2	18.4
56	17.8	18.0	18.2
60	17.6	17.9	18.0
64	17.5	17.7	17.8
68	17.3	17.5	17.6
72	17.1	17.2	17.4
76	16.9	17.0	17.1
80	16.7	16.8	16.9
84	16.5	16.6	16.7
88	16.4	16.4	16.5
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	21	22	23
°	′	′	′
0	13.5	13.3	13.2
4	13.5	13.3	13.2
8	13.6	13.3	13.2
12	13.6	13.4	13.2
16	13.6	13.4	13.3
20	13.7	13.5	13.4
24	13.8	13.6	13.5
28	13.9	13.7	13.6
32	14.0	13.8	13.7
36	14.1	14.0	13.8
40	14.2	14.1	14.0
44	14.4	14.2	14.2
48	14.5	14.4	14.3
52	14.7	14.6	14.5
56	14.8	14.8	14.7
60	15.0	14.9	14.9
64	15.2	15.1	15.1
68	15.4	15.3	15.3
72	15.5	15.5	15.5
76	15.7	15.7	15.8
80	15.9	16.0	16.0
84	16.1	16.2	16.2
88	16.3	16.3	16.4
90			

Subtract from table, back cover

Washington's Birthday 22

GMT	♈ GHA	VENUS −3.6 GHA	VENUS −3.6 Dec.	MARS 1.2 GHA	MARS 1.2 Dec.	JUPITER −2.1 GHA	JUPITER −2.1 Dec.	SATURN 0.7 GHA	SATURN 0.7 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
24 0	152 51.5	139 02.5	+ 6 00.8	246 19.0	−23 26.9	4 40.3	+14 07.3	271 55.8	−18 37.7	25 27.5	70	+14 54.7	−108
1	167 54.0	154 02.3	02.1	261 19.7	27.0	19 43.1	07.4	286 58.2	37.7	39 53.5	72	14 43.9	−110
2	182 56.4	169 02.1	03.4	276 20.4	27.1	34 45.8	07.5	302 00.6	37.7	54 19.7	71	14 32.9	−111
3	197 58.9	184 01.9	·· 04.7	291 21.0	·· 27.1	49 48.6	·· 07.6	317 03.0	·· 37.7	68 45.8	72	·14 21.8	−111
4	213 01.4	199 01.7	05.9	306 21.7	27.2	64 51.4	07.7	332 05.3	37.7	83 12.0	73	14 10.7	−113
5	228 03.8	214 01.5	07.2	321 22.4	27.3	79 54.2	07.8	347 07.7	37.7	97 38.3	74	13 59.4	−113
6	243 06.3	229 01.3	+ 6 08.5	336 23.1	−23 27.4	94 56.9	+14 07.9	2 10.1	−18 37.7	112 04.7	74	+13 48.1	−114
7	258 08.8	244 01.1	09.8	351 23.7	27.5	109 59.7	08.0	17 12.5	37.7	126 31.1	75	13 36.7	−115
8	273 11.2	259 00.9	11.1	6 24.4	27.5	125 02.5	08.2	32 14.9	37.7	140 57.6	75	13 25.2	−116
9	288 13.7	274 00.8	·· 12.3	21 25.1	·· 27.6	140 05.3	·· 08.3	47 17.3	·· 37.7	155 24.1	76	·13 13.6	−117
10	303 16.1	289 00.6	13.6	36 25.8	27.7	155 08.0	08.4	62 19.7	37.7	169 50.7	77	13 01.9	−117
11	318 18.6	304 00.4	14.9	51 26.5	27.8	170 10.8	08.5	77 22.1	37.7	184 17.4	77	12 50.2	−119
12	333 21.1	319 00.2	+ 6 16.2	66 27.1	−23 27.8	185 13.6	+14 08.6	92 24.5	−18 37.7	198 44.1	78	+12 38.3	−119
13	348 23.5	334 00.0	17.5	81 27.8	27.9	200 16.4	08.7	107 26.8	37.8	213 10.9	78	12 26.4	−119
14	3 26.0	348 59.8	18.8	96 28.5	28.0	215 19.1	08.8	122 29.2	37.8	227 37.7	79	12 14.5	−121
15	18 28.5	3 59.6	·· 20.0	111 29.2	·· 28.1	230 21.9	·· 08.9	137 31.6	·· 37.8	242 04.6	80	·12 02.4	−121
16	33 30.9	18 59.4	21.3	126 29.8	28.1	245 24.7	09.0	152 34.0	37.8	256 31.6	81	11 50.3	−122
17	48 33.4	33 59.2	22.6	141 30.5	28.2	260 27.5	09.1	167 36.4	37.8	270 58.7	80	11 38.1	−123
18	63 35.9	48 59.0	+ 6 23.9	156 31.2	−23 28.3	275 30.3	+14 09.3	182 38.8	−18 37.8	285 25.7	82	+11 25.8	−123
19	78 38.3	63 58.8	25.2	171 31.9	28.4	290 33.0	09.4	197 41.2	37.8	299 52.9	82	11 13.5	−124
20	93 40.8	78 58.6	26.4	186 32.6	28.4	305 35.8	09.5	212 43.6	37.8	314 20.1	83	11 01.1	−124
21	108 43.2	93 58.4	·· 27.7	201 33.2	·· 28.5	320 38.6	·· 09.6	227 46.0	·· 37.8	328 47.4	83	·10 48.7	−126
22	123 45.7	108 58.2	29.0	216 33.9	28.6	335 41.4	09.7	242 48.4	37.8	343 14.7	84	10 36.1	−125
23	138 48.2	123 58.0	30.3	231 34.6	28.6	350 44.1	09.8	257 50.8	37.8	357 42.1	85	10 23.6	−127
25 0	153 50.6	138 57.8	+ 6 31.5	246 35.3	−23 28.7	5 46.9	+14 09.9	272 53.1	−18 37.8	12 09.6	85	+10 10.9	−127
1	168 53.1	153 57.6	32.8	261 35.9	28.8	20 49.7	10.0	287 55.5	37.8	26 37.1	86	9 58.2	−127
2	183 55.6	168 57.4	34.1	276 36.6	28.9	35 52.5	10.1	302 57.9	37.8	41 04.7	86	9 45.5	−128
3	198 58.0	183 57.2	·· 35.4	291 37.3	·· 28.9	50 55.2	·· 10.2	318 00.3	·· 37.8	55 32.3	87	· 9 32.7	−129
4	214 00.5	198 57.0	36.7	306 38.0	29.0	65 58.0	10.4	333 02.7	37.9	70 00.0	87	9 19.8	−129
5	229 03.0	213 56.8	37.9	321 38.7	29.1	81 00.8	10.5	348 05.1	37.9	84 27.7	88	9 06.9	−129
6	244 05.4	228 56.6	+ 6 39.2	336 39.3	−23 29.1	96 03.5	+14 10.6	3 07.5	−18 37.9	98 55.5	89	+ 8 54.0	−130
7	259 07.9	243 56.4	40.5	351 40.0	29.2	111 06.3	10.7	18 09.9	37.9	113 23.4	89	8 41.0	−131
8	274 10.4	258 56.2	41.8	6 40.7	29.3	126 09.1	10.8	33 12.3	37.9	127 51.3	90	8 27.9	−130
9	289 12.8	273 56.1	·· 43.0	21 41.4	·· 29.3	141 11.9	·· 10.9	48 14.7	·· 37.9	142 19.3	90	· 8 14.9	−132
10	304 15.3	288 55.9	44.3	36 42.0	29.4	156 14.6	11.0	63 17.1	37.9	156 47.3	91	8 01.7	−131
11	319 17.7	303 55.7	45.6	51 42.7	29.5	171 17.4	11.1	78 19.5	37.9	171 15.4	91	7 48.6	−133
12	334 20.2	318 55.5	+ 6 46.9	66 43.4	−23 29.5	186 20.2	+14 11.2	93 21.9	−18 37.9	185 43.5	92	+ 7 35.3	−132
13	349 22.7	333 55.3	48.1	81 44.1	29.6	201 23.0	11.3	108 24.3	37.9	200 11.7	93	7 22.1	−133
14	4 25.1	348 55.1	49.4	96 44.7	29.7	216 25.7	11.5	123 26.7	37.9	214 40.0	93	7 08.8	−133
15	19 27.6	3 54.9	·· 50.7	111 45.4	·· 29.7	231 28.5	·· 11.6	138 29.0	·· 37.9	229 08.3	93	· 6 55.5	−133
16	34 30.1	18 54.7	52.0	126 46.1	29.8	246 31.3	11.7	153 31.4	37.9	243 36.6	94	6 42.2	−134
17	49 32.5	33 54.5	53.2	141 46.8	29.9	261 34.1	11.8	168 33.8	37.9	258 05.0	95	6 28.8	−134
18	64 35.0	48 54.3	+ 6 54.5	156 47.5	−23 29.9	276 36.8	+14 11.9	183 36.2	−18 37.9	272 33.5	95	+ 6 15.4	−135
19	79 37.5	63 54.1	55.8	171 48.1	30.0	291 39.6	12.0	198 38.6	37.9	287 02.0	95	6 01.9	−134
20	94 39.9	78 53.9	57.1	186 48.8	30.1	306 42.4	12.1	213 41.0	37.9	301 30.5	96	5 48.5	−135
21	109 42.4	93 53.7	·· 58.3	201 49.5	·· 30.1	321 45.2	·· 12.2	228 43.4	·· 38.0	315 59.1	97	· 5 35.0	−135
22	124 44.8	108 53.5	6 59.6	216 50.2	30.2	336 47.9	12.3	243 45.8	38.0	330 27.8	97	5 21.5	−135
23	139 47.3	123 53.3	7 00.9	231 50.8	30.3	351 50.7	12.4	258 48.2	38.0	344 56.5	97	5 08.0	−136
26 0	154 49.8	138 53.1	+ 7 02.2	246 51.5	−23 30.3	6 53.5	+14 12.6	273 50.6	−18 38.0	359 25.2	98	+ 4 54.4	−136
1	169 52.2	153 52.9	03.4	261 52.2	30.4	21 56.2	12.7	288 53.0	38.0	13 54.0	98	4 40.8	−135
2	184 54.7	168 52.7	04.7	276 52.9	30.4	36 59.0	12.8	303 55.4	38.0	28 22.8	99	4 27.3	−136
3	199 57.2	183 52.5	·· 06.0	291 53.6	·· 30.5	52 01.8	·· 12.9	318 57.8	·· 38.0	42 51.7	100	· 4 13.7	−136
4	214 59.6	198 52.3	07.2	306 54.2	30.6	67 04.6	13.0	334 00.2	38.0	57 20.7	99	4 00.1	−137
5	230 02.1	213 52.1	08.5	321 54.9	30.6	82 07.3	13.1	349 02.6	38.0	71 49.6	101	3 46.4	−136
6	245 04.6	228 51.9	+ 7 09.8	336 55.6	−23 30.7	97 10.1	+14 13.2	4 05.0	−18 38.0	86 18.7	100	+ 3 32.8	−136
7	260 07.0	243 51.8	11.1	351 56.3	30.8	112 12.9	13.3	19 07.4	38.0	100 47.7	101	3 19.2	−137
8	275 09.5	258 51.6	12.3	6 56.9	30.8	127 15.7	13.4	34 09.8	38.0	115 16.8	102	3 05.5	−136
9	290 12.0	273 51.4	·· 13.6	21 57.6	·· 30.9	142 18.4	·· 13.5	49 12.2	·· 38.0	129 46.0	101	· 2 51.9	−137
10	305 14.4	288 51.2	14.9	36 58.3	30.9	157 21.2	13.6	64 14.6	38.0	144 15.1	103	2 38.2	−137
11	320 16.9	303 51.0	16.1	51 59.0	31.0	172 24.0	13.7	79 17.0	38.0	158 44.4	102	2 24.5	−136
12	335 19.3	318 50.8	+ 7 17.4	66 59.6	−23 31.1	187 26.7	+14 13.9	94 19.4	−18 38.0	173 13.6	103	+ 2 10.9	−137
13	350 21.8	333 50.6	18.7	82 00.3	31.1	202 29.5	14.0	109 21.8	38.0	187 42.9	104	1 57.2	−136
14	5 24.3	348 50.4	19.9	97 01.0	31.2	217 32.3	14.1	124 24.2	38.0	202 12.3	104	1 43.6	−137
15	20 26.7	3 50.2	·· 21.2	112 01.7	·· 31.2	232 35.1	·· 14.2	139 26.6	·· 38.0	216 41.7	104	· 1 29.9	−137
16	35 29.2	18 50.0	22.5	127 02.3	31.3	247 37.8	14.3	154 29.0	38.0	231 11.1	104	1 16.2	−136
17	50 31.7	33 49.8	23.7	142 03.0	31.4	262 40.6	14.4	169 31.4	38.1	245 40.5	105	1 02.6	−136
18	65 34.1	48 49.6	+ 7 25.0	157 03.7	−23 31.4	277 43.4	+14 14.5	184 33.8	−18 38.1	260 10.0	105	+ 0 49.0	−137
19	80 36.6	63 49.4	26.3	172 04.4	31.5	292 46.1	14.6	199 36.2	38.1	274 39.5	106	0 35.3	−136
20	95 39.1	78 49.2	27.5	187 05.1	31.5	307 48.9	14.7	214 38.6	38.1	289 09.1	106	0 21.7	−136
21	110 41.5	93 49.0	·· 28.8	202 05.7	·· 31.6	322 51.7	·· 14.8	229 41.0	·· 38.1	303 38.7	106	+ 0 08.1	−136
22	125 44.0	108 48.8	30.1	217 06.4	31.6	337 54.5	14.9	244 43.4	38.1	318 08.3	107	− 0 05.5	−136
23	140 46.5	123 48.6	31.3	232 07.1	31.7	352 57.2	15.0	259 45.8	38.1	332 38.0	107	0 19.1	−135
24	155 48.9	138 48.4	+ 7 32.6	247 07.8	−23 31.7	8 00.0	+14 15.2	274 48.2	−18 38.1	347 07.7	107	− 0 32.6	−136
code	−	− 2	+ 12	+ 7	− 1	+ 28	+ 1	+ 24	0				

G M T	SUN GHA	SUN Dec.
h	° ′	° ′
24 0	176 37.5	− 9 54.8
1	191 37.6	53.9
2	206 37.7	53.0
3	221 37.7	52.0
4	236 37.8	51.1
5	251 37.9	50.2
6	266 38.0	− 9 49.3
7	281 38.1	48.4
8	296 38.2	47.5
9	311 38.3	46.5
10	326 38.4	45.6
11	341 38.5	44.7
12	356 38.5	− 9 43.8
13	11 38.6	42.9
14	26 38.7	41.9
15	41 38.8	41.0
16	56 38.9	40.1
17	71 39.0	39.2
18	86 39.1	− 9 38.3
19	101 39.2	37.3
20	116 39.3	36.4
21	131 39.4	35.5
22	146 39.4	34.6
23	161 39.5	33.7
25 0	176 39.6	− 9 32.7
1	191 39.7	31.8
2	206 39.8	30.9
3	221 39.9	30.0
4	236 40.0	29.0
5	251 40.1	28.1
6	266 40.2	− 9 27.2
7	281 40.3	26.3
8	296 40.4	25.4
9	311 40.5	24.4
10	326 40.6	23.5
11	341 40.7	22.6
12	356 40.8	− 9 21.7
13	11 40.9	20.7
14	26 41.0	19.8
15	41 41.0	18.9
16	56 41.1	18.0
17	71 41.2	17.0
18	86 41.3	− 9 16.1
19	101 41.4	15.2
20	116 41.5	14.2
21	131 41.6	13.3
22	146 41.7	12.4
23	161 41.8	11.5
26 0	176 41.9	− 9 10.5
1	191 42.0	09.6
2	206 42.1	08.7
3	221 42.2	07.8
4	236 42.3	06.8
5	251 42.4	05.9
6	266 42.5	− 9 05.0
7	281 42.6	04.0
8	296 42.7	03.1
9	311 42.8	02.2
10	326 42.9	01.2
11	341 43.0	9 00.3
12	356 43.1	− 8 59.4
13	11 43.2	58.5
14	26 43.3	57.5
15	41 43.4	56.6
16	56 43.5	55.7
17	71 43.6	54.7
18	86 43.7	− 8 53.8
19	101 43.8	52.9
20	116 44.0	51.9
21	131 44.1	51.0
22	146 44.2	50.1
23	161 44.3	49.1
24	176 44.4	− 8 48.2
code	—	+ 10

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.0	−40 29.0
5	Achernar	335 59.0	−57 27.7
30	Acrux	173 56.8	−62 51.4
19	Adhara	255 46.0	−28 55.0
10	Aldebaran	291 38.7	+16 25.3
32	Alioth	166 57.8	+56 11.5
34	Alkaid	153 32.3	+49 31.5
55	Al Na'ir	28 38.0	−47 10.4
15	Alnilam	276 29.8	− 1 13.9
25	Alphard	218 37.9	− 8 28.3
41	Alphecca	126 47.3	+26 51.4
1	Alpheratz	358 28.3	+28 51.0
51	Altair	62 50.3	+ 8 45.0
2	Ankaa	353 58.3	−42 32.7
42	Antares	113 19.0	−26 20.2
37	Arcturus	146 34.7	+19 24.3
43	Atria	108 59.5	−68 56.8
22	Avior	234 35.1	−59 22.4
13	Bellatrix	279 18.0	+ 6 18.6
16	Betelg'se	271 47.6	+ 7 23.9
17	Canopus	264 14.9	−52 40.6
12	Capella	281 37.8	+45 57.5
53	Deneb	50 01.2	+45 07.3
28	Denebola	183 17.1	+14 48.8
4	Diphda	349 39.2	−18 13.7
27	Dubhe	194 43.5	+61 59.1
14	Elnath	279 06.8	+28 34.4
47	Eltanin	91 06.3	+51 29.3
54	Enif	34 29.6	+ 9 40.4
56	Fomalhaut	16 11.6	−29 51.3
31	Gacrux	172 48.4	−56 52.1
29	Gienah	176 36.2	−17 18.1
35	Hadar	149 48.6	−60 09.7
6	Hamal	328 49.4	+23 15.4
48	Kaus Aust.	84 40.9	−34 24.3
40	Kochab	137 17.5	+74 19.7
57	Markab	14 21.4	+14 58.2
8	Menkar	315 00.1	+ 3 55.1
36	Menkent	148 58.0	−36 09.3
24	Miapl'dus	221 48.1	−69 32.4
9	Mirfak	309 42.0	+49 42.6
50	Nunki	76 51.7	−26 21.1
52	Peacock	54 27.3	−56 52.5
21	Pollux	244 19.9	+28 07.9
20	Procyon	245 44.4	+ 5 20.1
46	R'alhague	96 46.4	+12 35.3
26	Regulus	208 28.8	+12 10.7
11	Rigel	281 53.2	− 8 15.2
38	Rigil Kent.	140 50.2	−60 39.3
44	Sabik	103 01.9	−15 40.4
3	Schedar	350 30.0	+56 18.0
45	Shaula	97 20.3	−37 04.3
18	Sirius	259 11.4	−16 39.5
33	Spica	159 16.3	−10 56.2
23	Suhail	223 23.7	−43 15.5
49	Vega	81 08.3	+38 44.3
39	Zub'g'bi	137 52.9	−15 51.7

G M T	Equation of Time (App.—Mean) 24	25	26
h	m s	m s	m s
0	−13 30.2	−13 21.7	−13 12.5
6	−13 28.1	−13 19.4	−13 10.1
12	−13 26.0	−13 17.1	−13 07.7
18	−13 23.9	−13 14.8	−13 05.2
24	−13 21.7	−13 12.5	−13 02.7

Lat. N °	Sunrise h m	Twlt. begins h m
72	8 03	4 17
70	7 51	4 27
68	7 40	4 36
66	7 32	4 43
64	7 25	4 48
62	7 18	4 53
60	7 13	4 57
58	7 08	5 00
56	7 04	5 02
54	7 00	5 04
52	6 57	5 06
50	6 54	5 08
45	6 47	5 10
40	6 41	5 12
35	6 36	5 13
30	6 31	5 12
20	6 24	5 10
10	6 17	5 07
0	6 10	5 00
10	6 03	4 52
20	5 56	4 40
30	5 47	4 24
35	5 42	4 13
40	5 37	3 59
45	5 30	3 42
50	5 22	3 19
52	5 19	3 07
54	5 15	2 53
56	5 10	2 36
58	5 05	2 15
60 S	4 59	1 46

Lat. N °	Sunset h m	Twlt. ends h m
72	16 25	20 17
70	16 38	20 06
68	16 48	19 56
66	16 56	19 49
64	17 03	19 43
62	17 09	19 38
60	17 15	19 34
58	17 19	19 30
56	17 24	19 28
54	17 27	19 25
52	17 31	19 23
50	17 34	19 22
45	17 41	19 19
40	17 46	19 16
35	17 51	19 15
30	17 56	19 16
20	18 03	19 17
10	18 10	19 20
0	18 17	19 27
10	18 23	19 34
20	18 30	19 45
30	18 39	20 02
35	18 43	20 12
40	18 49	20 25
45	18 55	20 42
50	19 03	21 04
52	19 07	21 16
54	19 11	21 30
56	19 15	21 45
58	19 20	22 06
60 S	19 26	22 33

Lat. N °	Moonrise 24 h m	25 h m	26 h m	27 h m
72	14 05	16 25	18 34	20 39
70	14 28	16 35	18 35	20 31
68	14 45	16 43	18 35	20 25
66	14 59	16 49	18 36	20 19
64	15 10	16 55	18 36	20 15
62	15 20	17 00	18 37	20 11
60	15 28	17 04	18 37	20 08
58	15 35	17 08	18 38	20 05
56	15 42	17 11	18 38	20 02
54	15 47	17 14	18 38	20 00
52	15 52	17 16	18 38	19 58
50	15 57	17 19	18 38	19 56
45	16 07	17 24	18 39	19 52
40	16 15	17 28	18 39	19 49
35	16 22	17 32	18 40	19 46
30	16 28	17 35	18 40	19 43
20	16 39	17 41	18 40	19 39
10	16 48	17 45	18 41	19 35
0	16 57	17 50	18 41	19 31
10	17 05	17 55	18 42	19 28
20	17 15	18 00	18 42	19 24
30	17 25	18 05	18 43	19 20
35	17 31	18 08	18 43	19 17
40	17 38	18 12	18 44	19 15
45	17 46	18 16	18 44	19 12
50	17 55	18 21	18 45	19 08
52	18 00	18 23	18 45	19 06
54	18 04	18 26	18 46	19 04
56	18 10	18 29	18 46	19 02
58	18 15	18 32	18 46	19 00
60 S	18 22	18 35	18 47	18 58

Lat. N °	Moonset 24 h m	25 h m	26 h m	27 h m
72	7 42	7 16	6 56	6 38
70	7 18	7 03	6 52	6 41
68	6 59	6 53	6 48	6 43
66	6 44	6 45	6 45	6 45
64	6 31	6 38	6 43	6 47
62	6 20	6 32	6 40	6 48
60	6 11	6 26	6 39	6 50
58	6 03	6 21	6 37	6 51
56	5 56	6 17	6 35	6 52
54	5 49	6 13	6 34	6 53
52	5 44	6 10	6 32	6 54
50	5 38	6 06	6 31	6 54
45	5 27	5 59	6 29	6 56
40	5 17	5 54	6 27	6 58
35	5 09	5 48	6 25	6 59
30	5 02	5 44	6 23	7 00
20	4 49	5 36	6 20	7 02
10	4 38	5 29	6 17	7 04
0	4 28	5 22	6 15	7 05
10	4 17	5 16	6 12	7 07
20	4 06	5 08	6 09	7 08
30	3 53	5 00	6 06	7 10
35	3 45	4 55	6 04	7 11
40	3 36	4 50	6 02	7 13
45	3 26	4 43	6 00	7 14
50	3 14	4 36	5 57	7 16
52	3 08	4 32	5 55	7 16
54	3 01	4 28	5 54	7 17
56	2 54	4 24	5 52	7 18
58	2 46	4 19	5 50	7 19
60 S	2 37	4 13	5 48	7 20

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
24	23 10	14 44	7 34	23 37	5 51
25	24 02	14 44	7 33	23 33	5 48
26	0 02	14 45	7 32	23 28	5 44
27	0 53	14 45	7 31	23 24	5 40

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.5	0.1	0.1
30	0.5	0.1	0.1
45	0.5	0.1	0.1
60	0.5	0.1	0.0
75	0.5	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	24	25	26
°	′	′	′
0	19.7	19.4	18.7
4	19.7	19.4	18.7
8	19.7	19.3	18.7
12	19.7	19.3	18.7
16	19.6	19.2	18.6
20	19.5	19.2	18.6
24	19.4	19.1	18.5
28	19.3	19.0	18.4
32	19.2	18.9	18.3
36	19.1	18.7	18.2
40	18.9	18.6	18.1
44	18.7	18.5	18.0
48	18.6	18.3	17.8
52	18.4	18.1	17.7
56	18.2	18.0	17.6
60	18.0	17.8	17.4
64	17.8	17.6	17.2
68	17.6	17.4	17.1
72	17.4	17.2	16.9
76	17.1	17.0	16.8
80	16.9	16.8	16.6
84	16.7	16.6	16.4
88	16.5	16.4	16.3
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	24	25	26
°	′	′	′
0	13.2	13.4	13.7
4	13.2	13.4	13.7
8	13.2	13.4	13.8
12	13.2	13.5	13.8
16	13.3	13.5	13.9
20	13.4	13.6	13.9
24	13.5	13.7	14.0
28	13.6	13.8	14.1
32	13.7	13.9	14.2
36	13.8	14.0	14.3
40	14.0	14.1	14.4
44	14.2	14.3	14.5
48	14.3	14.4	14.6
52	14.5	14.6	14.8
56	14.7	14.8	14.9
60	14.9	15.0	15.1
64	15.1	15.1	15.2
68	15.3	15.3	15.4
72	15.5	15.5	15.5
76	15.8	15.7	15.7
80	16.0	15.9	15.9
84	16.2	16.2	16.1
88	16.4	16.3	16.2
90			

Subtract from table, back cover

Full Moon 26

GMT	♈ GHA	VENUS −3.6 GHA	Dec.	MARS 1.2 GHA	Dec.	JUPITER −2.1 GHA	Dec.	SATURN 0.7 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
27 0	155 48.9	138 48.4	+ 7 32.6	247 07.8	−23 31.7	8 00.0	+14 15.2	274 48.2	−18 38.1	347 07.7	107	− 0 32.6	−136
1	170 51.4	153 48.2	33.9	262 08.4	31.8	23 02.8	15.3	289 50.6	38.1	1 37.4	107	0 46.2	−135
2	185 53.8	168 48.0	35.1	277 09.1	31.9	38 05.5	15.4	304 53.0	38.1	16 07.1	108	0 59.7	−135
3	200 56.3	183 47.8	·· 36.4	292 09.8	·· 31.9	53 08.3	·· 15.5	319 55.4	·· 38.1	30 36.9	108	· 1 13.2	−135
4	215 58.8	198 47.6	37.7	307 10.5	32.0	68 11.1	15.6	334 57.8	38.1	45 06.7	108	1 26.7	−135
5	231 01.2	213 47.5	38.9	322 11.1	32.0	83 13.9	15.7	350 00.2	38.1	59 36.5	109	1 40.2	−134
6	246 03.7	228 47.3	+ 7 40.2	337 11.8	−23 32.1	98 16.6	+14 15.8	5 02.6	−18 38.1	74 06.4	109	− 1 53.6	−134
7	261 06.2	243 47.1	41.5	352 12.5	32.1	113 19.4	15.9	20 05.0	38.1	88 36.3	109	2 07.0	−134
8	276 08.6	258 46.9	42.7	7 13.2	32.2	128 22.2	16.0	35 07.4	38.1	103 06.2	109	2 20.4	−134
9	291 11.1	273 46.7	·· 44.0	22 13.8	·· 32.2	143 24.9	·· 16.1	50 09.8	·· 38.1	117 36.1	110	· 2 33.8	−133
10	306 13.6	288 46.5	45.3	37 14.5	32.3	158 27.7	16.2	65 12.2	38.1	132 06.1	110	2 47.1	−133
11	321 16.0	303 46.3	46.5	52 15.2	32.3	173 30.5	16.3	80 14.6	38.1	146 36.1	110	3 00.4	−133
12	336 18.5	318 46.1	+ 7 47.8	67 15.9	−23 32.4	188 33.2	+14 16.4	95 17.0	−18 38.1	161 06.1	110	− 3 13.7	−133
13	351 20.9	333 45.9	49.0	82 16.5	32.4	203 36.0	16.6	110 19.4	38.1	175 36.1	110	3 27.0	−132
14	6 23.4	348 45.7	50.3	97 17.2	32.5	218 38.8	16.7	125 21.8	38.1	190 06.1	111	3 40.2	−131
15	21 25.9	3 45.5	·· 51.6	112 17.9	·· 32.5	233 41.6	·· 16.8	140 24.2	·· 38.2	204 36.2	111	· 3 53.3	−132
16	36 28.3	18 45.3	52.8	127 18.6	32.6	248 44.3	16.9	155 26.6	38.2	219 06.3	111	4 06.5	−131
17	51 30.8	33 45.1	54.1	142 19.3	32.6	263 47.1	17.0	170 29.0	38.2	233 36.4	111	4 19.6	−130
18	66 33.3	48 44.9	+ 7 55.3	157 19.9	−23 32.7	278 49.9	+14 17.1	185 31.4	−18 38.2	248 06.5	112	− 4 32.6	−131
19	81 35.7	63 44.7	56.6	172 20.6	32.7	293 52.6	17.2	200 33.8	38.2	262 36.7	112	4 45.7	−129
20	96 38.2	78 44.5	57.9	187 21.3	32.8	308 55.4	17.3	215 36.2	38.2	277 06.9	111	4 58.6	−130
21	111 40.7	93 44.3	· 7 59.1	202 22.0	·· 32.8	323 58.2	·· 17.4	230 38.6	·· 38.2	291 37.0	112	· 5 11.6	−129
22	126 43.1	108 44.1	8 00.4	217 22.6	32.9	339 00.9	17.5	245 41.0	38.2	306 07.2	113	5 24.5	−128
23	141 45.6	123 43.9	01.6	232 23.3	32.9	354 03.7	17.6	260 43.4	38.2	320 37.5	112	5 37.3	−128
28 0	156 48.1	138 43.7	+ 8 02.9	247 24.0	−23 33.0	9 06.5	+14 17.7	275 45.8	−18 38.2	335 07.7	112	− 5 50.1	−128
1	171 50.5	153 43.5	04.2	262 24.7	33.0	24 09.2	17.8	290 48.2	38.2	349 37.9	113	6 02.9	−127
2	186 53.0	168 43.3	05.4	277 25.3	33.1	39 12.0	17.9	305 50.6	38.2	4 08.2	113	6 15.6	−127
3	201 55.4	183 43.1	·· 06.7	292 26.0	·· 33.1	54 14.8	·· 18.1	320 53.1	·· 38.2	18 38.5	112	· 6 28.3	−126
4	216 57.9	198 43.0	07.9	307 26.7	33.2	69 17.5	18.2	335 55.5	38.2	33 08.7	113	6 40.9	−125
5	232 00.4	213 42.8	09.2	322 27.4	33.2	84 20.3	18.3	350 57.9	38.2	47 39.0	113	6 53.4	−125
6	247 02.8	228 42.6	+ 8 10.4	337 28.0	−23 33.3	99 23.1	+14 18.4	6 00.3	−18 38.2	62 09.3	114	− 7 05.9	−125
7	262 05.3	243 42.4	11.7	352 28.7	33.3	114 25.8	18.5	21 02.7	38.2	76 39.7	113	7 18.4	−124
8	277 07.8	258 42.2	13.0	7 29.4	33.4	129 28.6	18.6	36 05.1	38.2	91 10.0	113	7 30.8	−123
9	292 10.2	273 42.0	·· 14.2	22 30.1	·· 33.4	144 31.4	·· 18.7	51 07.5	·· 38.2	105 40.3	114	· 7 43.1	−123
10	307 12.7	288 41.8	15.5	37 30.7	33.5	159 34.1	18.8	66 09.9	38.2	120 10.7	113	7 55.4	−123
11	322 15.2	303 41.6	16.7	52 31.4	33.5	174 36.9	18.9	81 12.3	38.2	134 41.0	114	8 07.7	−122
12	337 17.6	318 41.4	+ 8 18.0	67 32.1	−23 33.5	189 39.7	+14 19.0	96 14.7	−18 38.2	149 11.4	114	− 8 19.9	−121
13	352 20.1	333 41.2	19.2	82 32.8	33.6	204 42.4	19.1	111 17.1	38.2	163 41.8	114	8 32.0	−120
14	7 22.6	348 41.0	20.5	97 33.4	33.6	219 45.2	19.2	126 19.5	38.2	178 12.2	113	8 44.0	−120
15	22 25.0	3 40.8	·· 21.7	112 34.1	·· 33.7	234 48.0	·· 19.3	141 21.9	·· 38.2	192 42.5	114	· 8 56.0	−120
16	37 27.5	18 40.6	23.0	127 34.8	33.7	249 50.8	19.4	156 24.3	38.2	207 12.9	114	9 08.0	−118
17	52 29.9	33 40.4	24.3	142 35.5	33.8	264 53.5	19.5	171 26.7	38.2	221 43.3	114	9 19.8	−119
18	67 32.4	48 40.2	+ 8 25.5	157 36.1	−23 33.8	279 56.3	+14 19.6	186 29.1	−18 38.3	236 13.7	114	− 9 31.7	−117
19	82 34.9	63 40.0	26.8	172 36.8	33.8	294 59.0	19.8	201 31.6	38.3	250 44.1	114	9 43.4	−117
20	97 37.3	78 39.8	28.0	187 37.5	33.9	310 01.8	19.9	216 34.0	38.3	265 14.5	115	9 55.1	−116
21	112 39.8	93 39.6	·· 29.3	202 38.2	·· 33.9	325 04.6	·· 20.0	231 36.4	·· 38.3	279 45.0	114	·10 06.7	−115
22	127 42.3	108 39.4	30.5	217 38.8	34.0	340 07.3	20.1	246 38.8	38.3	294 15.4	114	10 18.2	−115
23	142 44.7	123 39.2	31.8	232 39.5	34.0	355 10.1	20.2	261 41.2	38.3	308 45.8	114	10 29.7	−114
29 0	157 47.2	138 39.0	+ 8 33.0	247 40.2	−23 34.0	10 12.9	+14 20.3	276 43.6	−18 38.3	323 16.2	114	−10 41.1	−114
1	172 49.7	153 38.8	34.3	262 40.9	34.1	25 15.6	20.4	291 46.0	38.3	337 46.6	115	10 52.5	−112
2	187 52.1	168 38.6	35.5	277 41.5	34.1	40 18.4	20.5	306 48.4	38.3	352 17.1	114	11 03.7	−112
3	202 54.6	183 38.4	·· 36.8	292 42.2	·· 34.2	55 21.2	·· 20.6	321 50.8	·· 38.3	6 47.5	114	·11 14.9	−112
4	217 57.0	198 38.2	38.0	307 42.9	34.2	70 23.9	20.7	336 53.2	38.3	21 17.9	114	11 26.1	−110
5	232 59.5	213 38.0	39.3	322 43.6	34.2	85 26.7	20.8	351 55.7	38.3	35 48.3	115	11 37.1	−110
6	248 02.0	228 37.9	+ 8 40.5	337 44.3	−23 34.3	100 29.5	+14 20.9	6 58.1	−18 38.3	50 18.8	114	−11 48.1	−109
7	263 04.4	243 37.7	41.8	352 44.9	34.3	115 32.2	21.0	22 00.5	38.3	64 49.2	114	11 59.0	−108
8	278 06.9	258 37.5	43.0	7 45.6	34.4	130 35.0	21.1	37 02.9	38.3	79 19.6	114	12 09.8	−108
9	293 09.4	273 37.3	·· 44.3	22 46.3	·· 34.4	145 37.8	·· 21.2	52 05.3	·· 38.3	93 50.0	115	·12 20.6	−107
10	308 11.8	288 37.1	45.5	37 47.0	34.4	160 40.5	21.3	67 07.7	38.3	108 20.5	114	12 31.3	−106
11	323 14.3	303 36.9	46.8	52 47.6	34.5	175 43.3	21.4	82 10.1	38.3	122 50.9	114	12 41.9	−105
12	338 16.8	318 36.7	+ 8 48.0	67 48.3	−23 34.5	190 46.1	+14 21.5	97 12.5	−18 38.3	137 21.3	114	−12 52.4	−105
13	353 19.2	333 36.5	49.3	82 49.0	34.5	205 48.8	21.6	112 14.9	38.3	151 51.7	114	13 02.9	−103
14	8 21.7	348 36.3	50.5	97 49.7	34.6	220 51.6	21.7	127 17.3	38.3	166 22.1	114	13 13.2	−103
15	23 24.2	3 36.1	·· 51.7	112 50.3	·· 34.6	235 54.4	·· 21.9	142 19.8	·· 38.3	180 52.5	114	·13 23.5	−102
16	38 26.6	18 35.9	53.0	127 51.0	34.6	250 57.1	22.0	157 22.2	38.3	195 22.9	114	13 33.7	−101
17	53 29.1	33 35.7	54.2	142 51.7	34.7	265 59.9	22.1	172 24.6	38.3	209 53.3	114	13 43.8	−101
18	68 31.5	48 35.5	+ 8 55.5	157 52.4	−23 34.7	281 02.6	+14 22.2	187 27.0	−18 38.3	224 23.7	114	−13 53.9	− 99
19	83 34.0	63 35.3	56.7	172 53.0	34.8	296 05.4	22.3	202 29.4	38.3	238 54.1	114	14 03.8	− 99
20	98 36.5	78 35.1	58.0	187 53.7	34.8	311 08.2	22.4	217 31.8	38.3	253 24.5	114	14 13.7	− 98
21	113 38.9	93 34.9	· 8 59.2	202 54.4	·· 34.8	326 10.9	·· 22.5	232 34.2	·· 38.3	267 54.9	113	·14 23.5	− 97
22	128 41.4	108 34.7	9 00.5	217 55.1	34.9	341 13.7	22.6	247 36.7	38.3	282 25.2	114	14 33.2	− 96
23	143 43.9	123 34.5	01.7	232 55.7	34.9	356 16.5	22.7	262 39.1	38.3	296 55.6	114	14 42.8	− 95
24	158 46.3	138 34.3	+ 9 02.9	247 56.4	−23 34.9	11 19.2	+14 22.8	277 41.5	−18 38.3	311 26.0	113	−14 52.3	− 95
code		− 2	+ 12	+ 7	− 1	+ 27	+ 1	+ 24	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
27 0	176 44.4	− 8 48.2
1	191 44.5	47.3
2	206 44.6	46.3
3	221 44.7	45.4
4	236 44.8	44.5
5	251 44.9	43.5
6	266 45.0	− 8 42.6
7	281 45.1	41.7
8	296 45.2	40.7
9	311 45.3	39.8
10	326 45.4	38.9
11	341 45.5	37.9
12	356 45.6	− 8 37.0
13	11 45.8	36.1
14	26 45.9	35.1
15	41 46.0	34.2
16	56 46.1	33.2
17	71 46.2	32.3
18	86 46.3	− 8 31.4
19	101 46.4	30.4
20	116 46.5	29.5
21	131 46.6	28.6
22	146 46.7	27.6
23	161 46.8	26.7
28 0	176 47.0	− 8 25.7
1	191 47.1	24.8
2	206 47.2	23.9
3	221 47.3	22.9
4	236 47.4	22.0
5	251 47.5	21.0
6	266 47.6	− 8 20.1
7	281 47.7	19.2
8	296 47.8	18.2
9	311 48.0	17.3
10	326 48.1	16.3
11	341 48.2	15.4
12	356 48.3	− 8 14.5
13	11 48.4	13.5
14	26 48.5	12.6
15	41 48.6	11.6
16	56 48.7	10.7
17	71 48.9	09.8
18	86 49.0	− 8 08.8
19	101 49.1	07.9
20	116 49.2	06.9
21	131 49.3	06.0
22	146 49.4	05.0
23	161 49.6	04.1
29 0	176 49.7	− 8 03.2
1	191 49.8	02.2
2	206 49.9	01.3
3	221 50.0	− 8 00.3
4	236 50.1	7 59.4
5	251 50.3	58.4
6	266 50.4	− 7 57.5
7	281 50.5	56.5
8	296 50.6	55.6
9	311 50.7	54.6
10	326 50.8	53.7
11	341 51.0	52.8
12	356 51.1	− 7 51.8
13	11 51.2	50.9
14	26 51.3	49.9
15	41 51.4	49.0
16	56 51.6	48.0
17	71 51.7	47.1
18	86 51.8	− 7 46.1
19	101 51.9	45.2
20	116 52.0	44.2
21	131 52.2	43.3
22	146 52.3	42.3
23	161 52.4	41.4
24	176 52.5	− 7 40.4
code	−	+ 10

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.0	−40 29.0
5	Achernar	335 59.0	−57 27.7
30	Acrux	173 56.8	−62 51.4
19	Adhara	255 46.0	−28 55.0
10	Aldebaran	291 38.7	+16 25.3
32	Alioth	166 57.8	+56 11.5
34	Alkaid	153 32.3	+49 31.5
55	Al Na'ir	28 38.0	−47 10.4
15	Alnilam	276 29.8	− 1 13.9
25	Alphard	218 37.9	− 8 28.3
41	Alphecca	126 47.3	+26 51.4
1	Alpheratz	358 28.3	+28 51.0
51	Altair	62 50.3	+ 8 45.0
2	Ankaa	353 58.3	−42 32.7
42	Antares	113 18.9	−26 20.2
37	Arcturus	146 34.7	+19 24.3
43	Atria	108 59.4	−68 56.8
22	Avior	234 35.1	−59 22.4
13	Bellatrix	279 18.0	+ 6 18.6
16	Betelg'se	271 47.6	+ 7 23.9
17	Canopus	264 15.0	−52 40.6
12	Capella	281 37.8	+45 57.5
53	Deneb	50 01.2	+45 07.3
28	Denebola	183 17.1	+14 48.8
4	Diphda	349 39.2	−18 13.7
27	Dubhe	194 43.5	+61 59.1
14	Elnath	279 06.8	+28 34.4
47	Eltanin	91 06.3	+51 29.3
54	Enif	34 29.6	+ 9 40.4
56	Fomalhaut	16 11.6	−29 51.3
31	Gacrux	172 48.3	−56 52.1
29	Gienah	176 36.2	−17 18.1
35	Hadar	149 48.5	−60 09.7
6	Hamal	328 49.5	+23 15.4
48	Kaus Aust.	84 40.9	−34 24.3
40	Kochab	137 17.5	+74 19.7
57	Markab	14 21.4	+14 58.2
8	Menkar	315 00.1	+ 3 55.1
36	Menkent	148 58.0	−36 09.3
24	Miapl'dus	221 48.1	−69 32.4
9	Mirfak	309 42.0	+49 42.6
50	Nunki	76 51.7	−26 21.1
52	Peacock	54 27.2	−56 52.5
21	Pollux	244 19.9	+28 07.9
20	Procyon	245 44.4	+ 5 20.1
46	R'alhague	96 46.4	+12 35.3
26	Regulus	208 28.8	+12 10.7
11	Rigel	281 53.2	− 8 15.2
38	Rigil Kent.	140 50.2	−60 39.3
44	Sabik	103 01.8	−15 40.4
3	Schedar	350 30.1	+56 18.0
45	Shaula	97 20.3	−37 04.3
18	Sirius	259 11.4	−16 39.5
33	Spica	159 16.3	−10 56.2
23	Suhail	223 23.7	−43 15.6
49	Vega	81 08.2	+38 44.3
39	Zub'g'bi	137 52.8	−15 51.8

GMT	Equation of Time (App. Mean) 27	28	29
h	m s	m s	m s
0	−13 02.7	−12 52.4	−12 41.6
6	−13 00.2	−12 49.7	−12 38.7
12	−12 57.6	−12 47.0	−12 35.9
18	−12 55.0	−12 44.3	−12 33.1
24	−12 52.4	−12 41.6	−12 30.2

Lat. N°	Sunrise	Twlt. begins	Moonrise 27	28	29	1
	h m	h m	h m	h m	h m	h m
72	7 47	4 00	20 39	22 45	25 02	1 02
70	7 36	4 13	20 31	22 27	24 26	0 26
68	7 28	4 24	20 25	22 12	24 00	0 00
66	7 20	4 31	20 19	22 01	23 41	25 19
64	7 14	4 38	20 15	21 51	23 25	24 56
62	7 09	4 43	20 11	21 43	23 13	24 38
60	7 04	4 48	20 08	21 36	23 02	24 23
58	7 00	4 52	20 05	21 30	22 52	24 11
56	6 57	4 55	20 02	21 25	22 44	24 00
54	6 53	4 58	20 00	21 20	22 37	23 50
52	6 50	5 00	19 58	21 15	22 30	23 42
50	6 48	5 02	19 56	21 12	22 24	23 34
45	6 42	5 05	19 52	21 03	22 12	23 18
40	6 36	5 08	19 49	20 56	22 01	23 04
35	6 32	5 09	19 46	20 50	21 53	22 53
30	6 28	5 09	19 43	20 45	21 45	22 43
20	6 21	5 09	19 39	20 36	21 32	22 27
10	6 15	5 06	19 35	20 28	21 20	22 12
0	6 09	5 01	19 31	20 20	21 09	21 58
10	6 04	4 52	19 28	20 13	20 58	21 45
20	5 57	4 42	19 24	20 05	20 47	21 30
30	5 50	4 27	19 20	19 56	20 34	21 14
35	5 45	4 16	19 17	19 51	20 27	21 04
40	5 40	4 03	19 15	19 46	20 18	20 54
45	5 34	3 47	19 12	19 39	20 09	20 41
50	5 27	3 26	19 08	19 31	19 57	20 26
52	5 24	3 15	19 06	19 28	19 51	20 19
54	5 20	3 02	19 04	19 24	19 45	20 11
56	5 16	2 47	19 02	19 19	19 39	20 02
58	5 12	2 28	19 00	19 15	19 31	19 52
60	5 07	2 03	18 58	19 09	19 23	19 40

Lat. N°	Sunset	Twlt. ends	Moonset 27	28	29	1
	h m	h m	h m	h m	h m	h m
72	16 40	20 32	6 38	6 19	5 56	5 22
70	16 51	20 19	6 41	6 29	6 17	6 00
68	16 59	20 07	6 43	6 38	6 32	6 27
66	17 07	20 00	6 45	6 45	6 45	6 47
64	17 13	19 53	6 47	6 51	6 56	7 03
62	17 18	19 47	6 48	6 56	7 05	7 17
60	17 22	19 41	6 50	7 01	7 13	7 29
58	17 26	19 37	6 51	7 05	7 20	7 39
56	17 30	19 34	6 52	7 09	7 27	7 48
54	17 33	19 31	6 53	7 12	7 32	7 55
52	17 36	19 28	6 54	7 15	7 37	8 03
50	17 39	19 27	6 54	7 18	7 42	8 09
45	17 45	19 23	6 56	7 24	7 52	8 23
40	17 50	19 20	6 58	7 29	8 00	8 34
35	17 54	19 18	6 59	7 33	8 08	8 44
30	17 58	19 18	7 00	7 37	8 14	8 53
20	18 04	19 17	7 02	7 43	8 25	9 07
10	18 10	19 20	7 04	7 49	8 35	9 20
0	18 16	19 25	7 05	7 55	8 44	9 33
10	18 22	19 33	7 07	8 00	8 53	9 45
20	18 28	19 43	7 08	8 06	9 02	9 58
30	18 36	19 58	7 10	8 13	9 14	10 13
35	18 40	20 08	7 11	8 17	9 20	10 22
40	18 45	20 20	7 13	8 21	9 27	10 32
45	18 51	20 36	7 14	8 26	9 36	10 44
50	18 57	20 56	7 16	8 32	9 47	10 58
52	19 01	21 08	7 16	8 35	9 51	11 05
54	19 04	21 19	7 17	8 38	9 57	11 12
56	19 08	21 34	7 18	8 42	10 03	11 20
58	19 12	21 52	7 19	8 46	10 09	11 30
60	19 17	22 15	7 20	8 50	10 17	11 41

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
27	0 53	14 45	7 31	23 24	5 40
28	1 43	14 45	7 30	23 19	5 36
29	2 32	14 46	7 29	23 15	5 32
1	3 21	14 46	7 28	23 11	5 28

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.5	0.1	0.1
30	0.5	0.1	0.1
45	0.5	0.1	0.1
60	0.5	0.1	0.0
75	0.5	0.0	0.0
90			

Moon's Lower Limb — Add

Alt.	27	28	29
°	′	′	′
0	17.8	16.8	15.7
4	17.8	16.8	15.7
8	17.8	16.8	15.7
12	17.8	16.8	15.7
16	17.8	16.8	15.7
20	17.7	16.8	15.7
24	17.7	16.7	15.7
28	17.6	16.7	15.7
32	17.5	16.7	15.7
36	17.5	16.6	15.7
40	17.4	16.6	15.7
44	17.3	16.5	15.6
48	17.2	16.5	15.6
52	17.1	16.4	15.6
56	17.0	16.4	15.6
60	16.9	16.3	15.6
64	16.8	16.2	15.6
68	16.7	16.2	15.6
72	16.5	16.1	15.6
76	16.4	16.0	15.6
80	16.3	16.0	15.6
84	16.2	15.9	15.6
88	16.1	15.8	15.6
90			

Add to table, back cover

Moon's Upper Limb — Subtract

Alt.	27	28	29
°	′	′	′
0	14.2	14.8	15.5
4	14.3	14.8	15.5
8	14.3	14.8	15.5
12	14.3	14.9	15.5
16	14.3	14.9	15.5
20	14.4	14.9	15.5
24	14.4	14.9	15.5
28	14.5	15.0	15.5
32	14.5	15.0	15.5
36	14.6	15.0	15.5
40	14.7	15.1	15.5
44	14.8	15.1	15.5
48	14.9	15.2	15.5
52	15.0	15.2	15.5
56	15.1	15.3	15.5
60	15.2	15.4	15.5
64	15.3	15.4	15.5
68	15.4	15.5	15.5
72	15.5	15.5	15.6
76	15.7	15.6	15.6
80	15.8	15.7	15.6
84	15.9	15.8	15.6
88	16.0	15.8	15.6
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.7 GHA	VENUS −3.7 Dec.	MARS 1.2 GHA	MARS 1.2 Dec.	JUPITER −2.1 GHA	JUPITER −2.1 Dec.	SATURN 0.7 GHA	SATURN 0.7 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
1 00	158 46.3	138 34.3	+ 9 02.9	247 56.4	−23 34.9	11 19.2	+14 22.8	277 41.5	−18 38.3	311 26.0	113	−14 52.3	− 95
01	173 48.8	153 34.1	04.2	262 57.1	35.0	26 22.0	22.9	292 43.9	38.3	325 56.3	114	15 01.8	− 93
02	188 51.3	168 33.9	05.4	277 57.8	35.0	41 24.8	23.0	307 46.3	38.3	340 26.7	113	15 11.1	− 93
03	203 53.7	183 33.7	·· 06.7	292 58.4	·· 35.0	56 27.5	·· 23.1	322 48.7	·· 38.3	354 57.0	114	·15 20.4	− 92
04	218 56.2	198 33.5	07.9	307 59.1	35.0	71 30.3	23.2	337 51.1	38.3	9 27.4	113	15 29.6	− 91
05	233 58.7	213 33.3	09.2	322 59.8	35.1	86 33.0	23.3	352 53.5	38.3	23 57.7	113	15 38.7	− 90
06	249 01.1	228 33.1	+ 9 10.4	338 00.5	−23 35.1	101 35.8	+14 23.4	7 56.0	−18 38.3	38 28.0	113	−15 47.7	− 89
07	264 03.6	243 32.9	11.6	353 01.1	35.1	116 38.6	23.5	22 58.4	38.3	52 58.3	113	15 56.6	− 88
08	279 06.0	258 32.7	12.9	8 01.8	35.2	131 41.3	23.6	38 00.8	38.3	67 28.6	113	16 05.4	− 87
09	294 08.5	273 32.5	·· 14.1	23 02.5	·· 35.2	146 44.1	·· 23.7	53 03.2	·· 38.3	81 58.9	113	·16 14.1	− 87
10	309 11.0	288 32.3	15.4	38 03.2	35.2	161 46.9	23.8	68 05.6	38.4	96 29.2	113	16 22.8	− 85
11	324 13.4	303 32.1	16.6	53 03.8	35.3	176 49.6	23.9	83 08.0	38.4	110 59.5	113	16 31.3	− 85
12	339 15.9	318 31.9	+ 9 17.8	68 04.5	−23 35.3	191 52.4	+14 24.0	98 10.5	−18 38.4	125 29.8	113	−16 39.8	− 83
13	354 18.4	333 31.7	19.1	83 05.2	35.3	206 55.1	24.1	113 12.9	38.4	140 00.1	112	16 48.1	− 83
14	9 20.8	348 31.5	20.3	98 05.9	35.3	221 57.9	24.2	128 15.3	38.4	154 30.3	113	16 56.4	− 82
15	24 23.3	3 31.4	·· 21.6	113 06.5	·· 35.4	237 00.7	·· 24.3	143 17.7	·· 38.4	169 00.6	112	·17 04.6	− 80
16	39 25.8	18 31.2	22.8	128 07.2	35.4	252 03.4	24.5	158 20.1	38.4	183 30.8	113	17 12.6	− 80
17	54 28.2	33 31.0	24.0	143 07.9	35.4	267 06.2	24.6	173 22.5	38.4	198 01.1	112	17 20.6	− 79
18	69 30.7	48 30.8	+ 9 25.3	158 08.6	−23 35.5	282 08.9	+14 24.7	188 25.0	−18 38.4	212 31.3	112	−17 28.5	− 78
19	84 33.1	63 30.6	26.5	173 09.2	35.5	297 11.7	24.8	203 27.4	38.4	227 01.5	113	17 36.3	− 77
20	99 35.6	78 30.4	27.7	188 09.9	35.5	312 14.5	24.9	218 29.8	38.4	241 31.8	112	17 44.0	− 76
21	114 38.1	93 30.2	·· 29.0	203 10.6	·· 35.5	327 17.2	·· 25.0	233 32.2	·· 38.4	256 02.0	112	·17 51.6	− 75
22	129 40.5	108 30.0	30.2	218 11.3	35.6	342 20.0	25.1	248 34.6	38.4	270 32.2	112	17 59.1	− 74
23	144 43.0	123 29.8	31.5	233 11.9	35.6	357 22.7	25.2	263 37.0	38.4	285 02.4	112	18 06.5	− 73
2 00	159 45.5	138 29.6	+ 9 32.7	248 12.6	−23 35.6	12 25.5	+14 25.3	278 39.5	−18 38.4	299 32.6	111	−18 13.8	− 72
01	174 47.9	153 29.4	33.9	263 13.3	35.6	27 28.3	25.4	293 41.9	38.4	314 02.7	112	18 21.0	− 71
02	189 50.4	168 29.2	35.2	278 14.0	35.7	42 31.0	25.5	308 44.3	38.4	328 32.9	112	18 28.1	− 70
03	204 52.9	183 29.0	·· 36.4	293 14.6	·· 35.7	57 33.8	·· 25.6	323 46.7	·· 38.4	343 03.1	111	·18 35.1	− 69
04	219 55.3	198 28.8	37.6	308 15.3	35.7	72 36.5	25.7	338 49.1	38.4	357 33.2	112	18 42.0	− 68
05	234 57.8	213 28.6	38.9	323 16.0	35.7	87 39.3	25.8	353 51.5	38.4	12 03.4	111	18 48.8	− 67
06	250 00.3	228 28.4	+ 9 40.1	338 16.7	−23 35.7	102 42.1	+14 25.9	8 54.0	−18 38.4	26 33.5	112	−18 55.5	− 66
07	265 02.7	243 28.2	41.3	353 17.3	35.8	117 44.8	26.0	23 56.4	38.4	41 03.7	111	19 02.1	− 65
08	280 05.2	258 28.0	42.6	8 18.0	35.8	132 47.6	26.1	38 58.8	38.4	55 33.8	111	19 08.6	− 64
09	295 07.6	273 27.8	·· 43.8	23 18.7	·· 35.8	147 50.3	·· 26.2	54 01.2	·· 38.4	70 03.9	111	·19 15.0	− 63
10	310 10.1	288 27.6	45.0	38 19.4	35.8	162 53.1	26.3	69 03.6	38.4	84 34.0	111	19 21.3	− 62
11	325 12.6	303 27.4	46.2	53 20.0	35.9	177 55.9	26.4	84 06.1	38.4	99 04.1	111	19 27.5	− 61
12	340 15.0	318 27.2	+ 9 47.5	68 20.7	−23 35.9	192 58.6	+14 26.5	99 08.5	−18 38.4	113 34.2	111	−19 33.6	− 60
13	355 17.5	333 27.0	48.7	83 21.4	35.9	208 01.4	26.6	114 10.9	38.4	128 04.3	111	19 39.6	− 59
14	10 20.0	348 26.8	49.9	98 22.1	35.9	223 04.1	26.7	129 13.3	38.4	142 34.4	111	19 45.5	− 58
15	25 22.4	3 26.6	·· 51.2	113 22.7	·· 35.9	238 06.9	·· 26.8	144 15.7	·· 38.4	157 04.5	111	·19 51.3	− 56
16	40 24.9	18 26.4	52.4	128 23.4	36.0	253 09.6	26.9	159 18.2	38.4	171 34.6	111	19 56.9	− 56
17	55 27.4	33 26.2	53.6	143 24.1	36.0	268 12.4	27.0	174 20.6	38.4	186 04.7	110	20 02.5	− 55
18	70 29.8	48 26.0	+ 9 54.9	158 24.8	−23 36.0	283 15.2	+14 27.1	189 23.0	−18 38.4	200 34.7	111	−20 08.0	− 54
19	85 32.3	63 25.8	56.1	173 25.4	36.0	298 17.9	27.2	204 25.4	38.4	215 04.8	111	20 13.4	− 52
20	100 34.8	78 25.6	57.3	188 26.1	36.0	313 20.7	27.3	219 27.8	38.4	229 34.9	110	20 18.6	− 52
21	115 37.2	93 25.4	·· 58.5	203 26.8	·· 36.1	328 23.4	·· 27.4	234 30.3	·· 38.4	244 04.9	111	·20 23.8	− 50
22	130 39.7	108 25.2	9 59.8	218 27.5	36.1	343 26.2	27.5	249 32.7	38.4	258 35.0	110	20 28.8	− 50
23	145 42.1	123 25.0	10 01.0	233 28.1	36.1	358 28.9	27.6	264 35.1	38.4	273 05.0	110	20 33.8	− 48
3 00	160 44.6	138 24.8	+10 02.2	248 28.8	−23 36.1	13 31.7	+14 27.7	279 37.5	−18 38.4	287 35.0	111	−20 38.6	− 48
01	175 47.1	153 24.6	03.4	263 29.5	36.1	28 34.5	27.8	294 40.0	38.4	302 05.1	110	20 43.4	− 46
02	190 49.5	168 24.4	04.7	278 30.2	36.1	43 37.2	27.9	309 42.4	38.4	316 35.1	111	20 48.0	− 45
03	205 52.0	183 24.2	·· 05.9	293 30.8	·· 36.2	58 40.0	·· 28.0	324 44.8	·· 38.4	331 05.2	110	·20 52.5	− 44
04	220 54.5	198 24.0	07.1	308 31.5	36.2	73 42.7	28.1	339 47.2	38.4	345 35.2	110	20 56.9	− 44
05	235 56.9	213 23.8	08.3	323 32.2	36.2	88 45.5	28.2	354 49.6	38.4	0 05.2	110	21 01.3	− 42
06	250 59.4	228 23.6	+10 09.6	338 32.9	−23 36.2	103 48.2	+14 28.3	9 52.1	−18 38.4	14 35.2	111	−21 05.5	− 41
07	266 01.9	243 23.4	10.8	353 33.5	36.2	118 51.0	28.4	24 54.5	38.4	29 05.3	110	21 09.6	− 40
08	281 04.3	258 23.2	12.0	8 34.2	36.2	133 53.8	28.5	39 56.9	38.4	43 35.3	110	21 13.6	− 39
09	296 06.8	273 23.0	·· 13.2	23 34.9	·· 36.2	148 56.5	·· 28.6	54 59.3	·· 38.4	58 05.3	110	·21 17.5	− 37
10	311 09.2	288 22.8	14.5	38 35.6	36.3	163 59.3	28.7	70 01.8	38.4	72 35.3	111	21 21.2	− 37
11	326 11.7	303 22.6	15.7	53 36.2	36.3	179 02.0	28.8	85 04.2	38.4	87 05.4	110	21 24.9	− 36
12	341 14.2	318 22.4	+10 16.9	68 36.9	−23 36.3	194 04.8	+14 28.9	100 06.6	−18 38.4	101 35.4	110	−21 28.5	− 34
13	356 16.6	333 22.2	18.1	83 37.6	36.3	209 07.5	29.0	115 09.0	38.4	116 05.4	110	21 31.9	− 34
14	11 19.1	348 22.0	19.3	98 38.3	36.3	224 10.3	29.1	130 11.5	38.4	130 35.4	111	21 35.3	− 32
15	26 21.6	3 21.8	·· 20.6	113 38.9	·· 36.3	239 13.0	·· 29.2	145 13.9	·· 38.4	145 05.5	110	·21 38.5	− 32
16	41 24.0	18 21.6	21.8	128 39.6	36.3	254 15.8	29.3	160 16.3	38.4	159 35.5	110	21 41.7	− 30
17	56 26.5	33 21.4	23.0	143 40.3	36.4	269 18.5	29.4	175 18.7	38.4	174 05.5	111	21 44.7	− 29
18	71 29.0	48 21.2	+10 24.2	158 41.0	−23 36.4	284 21.3	+14 29.5	190 21.2	−18 38.4	188 35.6	110	−21 47.6	− 28
19	86 31.4	63 21.0	25.4	173 41.6	36.4	299 24.1	29.6	205 23.6	38.4	203 05.6	110	21 50.4	− 27
20	101 33.9	78 20.8	26.7	188 42.3	36.4	314 26.8	29.7	220 26.0	38.4	217 35.6	111	21 53.1	− 26
21	116 36.4	93 20.6	·· 27.9	203 43.0	·· 36.4	329 29.6	·· 29.8	235 28.4	·· 38.4	232 05.7	110	·21 55.7	− 25
22	131 38.8	108 20.4	29.1	218 43.7	36.4	344 32.3	29.9	250 30.9	38.4	246 35.7	111	21 58.2	− 24
23	146 41.3	123 20.2	30.3	233 44.3	36.4	359 35.1	30.0	265 33.3	38.4	261 05.8	110	22 00.6	− 23
24	161 43.7	138 20.0	+10 31.5	248 45.0	−23 36.4	14 37.8	+14 30.1	280 35.7	−18 38.4	275 35.8	111	−22 02.9	− 22
code	—	− 2	+ 12	+ 7	0	+ 28	+ 1	+ 24	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
1 00	176 52.5	− 7 40.4	7	Acamar	315 51.0	−40 29.0
01	191 52.6	39.5	5	Achernar	335 59.0	−57 27.7
02	206 52.8	38.5	30	Acrux	173 56.8	−62 51.4
03	221 52.9	·· 37.6	19	Adhara	255 46.1	−28 55.0
04	236 53.0	36.6	10	Aldebaran	291 38.7	+16 25.3
05	251 53.1	35.7				
06	266 53.3	− 7 34.7	32	Alioth	166 57.8	+56 11.5
07	281 53.4	33.8	34	Alkaid	153 32.3	+49 31.6
08	296 53.5	32.8	55	Al Na'ir	28 38.0	−47 10.4
09	311 53.6	·· 31.9	15	Alnilam	276 29.9	− 1 13.9
10	326 53.7	30.9	25	Alphard	218 37.9	− 8 28.3
11	341 53.9	30.0				
12	356 54.0	− 7 29.0	41	Alphecca	126 47.2	+26 51.4
13	11 54.1	28.1	1	Alpheratz	358 28.3	+28 51.0
14	26 54.2	27.1	51	Altair	62 50.3	+ 8 45.0
15	41 54.4	·· 26.2	2	Ankaa	353 58.3	−42 32.7
16	56 54.5	25.2	42	Antares	113 18.9	−26 20.2
17	71 54.6	24.3				
18	86 54.7	− 7 23.3	37	Arcturus	146 34.7	+19 24.3
19	101 54.9	22.4	43	Atria	108 59.3	−68 56.8
20	116 55.0	21.4	22	Avior	234 35.1	−59 22.4
21	131 55.1	·· 20.5	13	Bellatrix	279 18.0	+ 6 18.6
22	146 55.2	19.5	16	Betelg'se	271 47.7	+ 7 23.9
23	161 55.4	18.6				
2 00	176 55.5	− 7 17.6	17	Canopus	264 15.0	−52 40.6
01	191 55.6	16.7	12	Capella	281 37.8	+45 57.5
02	206 55.7	15.7	53	Deneb	50 01.1	+45 07.3
03	221 55.9	·· 14.8	28	Denebola	183 17.1	+14 48.8
04	236 56.0	13.8	4	Diphda	349 39.2	−18 13.7
05	251 56.1	12.9	27	Dubhe	194 43.5	+61 59.1
06	266 56.3	− 7 11.9	14	Elnath	279 06.8	+28 34.4
07	281 56.4	10.9	47	Eltanin	91 06.2	+51 29.3
08	296 56.5	10.0	54	Enif	34 29.6	+ 9 40.4
09	311 56.6	·· 09.0	56	Fomalhaut	16 11.6	−29 51.3
10	326 56.8	08.1				
11	341 56.9	07.1	31	Gacrux	172 48.3	−56 52.1
12	356 57.0	− 7 06.2	29	Gienah	176 36.2	−17 18.1
13	11 57.2	05.2	35	Hadar	149 48.5	−60 09.7
14	26 57.3	04.3	6	Hamal	328 49.5	+23 15.4
15	41 57.4	·· 03.3	48	Kaus Aust.	84 40.9	−34 24.3
16	56 57.5	02.3				
17	71 57.7	01.4	40	Kochab	137 17.4	+74 19.7
18	86 57.8	− 7 00.4	57	Markab	14 21.4	+14 58.1
19	101 57.9	6 59.5	8	Menkar	315 00.1	+ 3 55.1
20	116 58.1	58.5	36	Menkent	148 58.0	−36 09.4
21	131 58.2	·· 57.6	24	Miapl'dus	221 48.1	−69 32.5
22	146 58.3	56.6				
23	161 58.5	55.7	9	Mirfak	309 42.0	+49 42.6
			50	Nunki	76 51.7	−26 21.1
3 00	176 58.6	− 6 54.7	52	Peacock	54 27.2	−56 52.5
01	191 58.7	53.7	21	Pollux	244 19.9	+28 07.9
02	206 58.8	52.8	20	Procyon	245 44.4	+ 5 20.1
03	221 59.0	·· 51.8				
04	236 59.1	50.9	46	R'alhague	96 46.4	+12 35.3
05	251 59.2	49.9	26	Regulus	208 28.8	+12 10.7
06	266 59.4	− 6 48.9	11	Rigel	281 53.3	− 8 15.2
07	281 59.5	48.0	38	Rigil Kent.	140 50.1	−60 39.3
08	296 59.6	47.0	44	Sabik	103 01.8	−15 40.4
09	311 59.8	·· 46.1				
10	326 59.9	45.1	3	Schedar	350 30.1	+56 18.0
11	342 00.0	44.2	45	Shaula	97 20.3	−37 04.3
12	357 00.2	− 6 43.2	18	Sirius	259 11.4	−16 39.5
13	12 00.3	42.2	33	Spica	159 16.3	−10 56.2
14	27 00.4	41.3	23	Suhail	223 23.7	−43 15.6
15	42 00.6	·· 40.3				
16	57 00.7	39.4	49	Vega	81 08.2	+38 44.3
17	72 00.8	38.4	39	Zub'g'bi	137 52.8	−15 51.8
18	87 01.0	− 6 37.4				
19	102 01.1	36.5				
20	117 01.2	35.5				
21	132 01.4	·· 34.6				
22	147 01.5	33.6				
23	162 01.7	32.6				
24	177 01.8	− 6 31.7				
code	−	+ 10				

Lat.	Sunrise	Twlt. begins	Moonrise 1	2	3	4
N °	h m	h m	h m	h m	h m	h m
72	7 31	3 43	1 02	▬	▬	▬
70	7 23	3 58	0 26	2 39	▬	▬
68	7 15	4 10	0 00	1 50	3 46	▬
66	7 09	4 20	25 19	1 19	2 53	4 14
64	7 04	4 27	24 56	0 56	2 21	3 33
62	7 00	4 34	24 38	0 38	1 57	3 05
60	6 56	4 40	24 23	0 23	1 38	2 44
58	6 52	4 44	24 11	0 11	1 23	2 26
56	6 49	4 48	24 00	0 00	1 10	2 11
54	6 46	4 51	23 50	24 58	0 58	1 59
52	6 44	4 54	23 42	24 48	0 48	1 47
50	6 41	4 55	23 34	24 39	0 39	1 38
45	6 36	5 00	23 18	24 20	0 20	1 17
40	6 32	5 04	23 04	24 04	0 04	1 00
35	6 28	5 06	22 53	23 51	24 46	0 46
30	6 25	5 06	22 43	23 40	24 33	0 33
20	6 19	5 07	22 27	23 20	24 12	0 12
10	6 14	5 04	22 12	23 03	23 54	24 44
0	6 09	5 00	21 58	22 48	23 37	24 27
10	6 04	4 53	21 45	22 32	23 20	24 09
20	5 58	4 43	21 30	22 15	23 02	23 51
30	5 52	4 29	21 14	21 56	22 42	23 30
35	5 48	4 20	21 04	21 45	22 29	23 17
40	5 44	4 07	20 54	21 32	22 16	23 03
45	5 39	3 53	20 41	21 18	21 59	22 46
50	5 32	3 33	20 26	20 59	21 39	22 25
52	5 30	3 23	20 19	20 51	21 29	22 15
54	5 27	3 12	20 11	20 41	21 18	22 04
56	5 23	2 58	20 02	20 30	21 06	21 51
58	5 19	2 41	19 52	20 18	20 52	21 36
60	5 15	2 20	19 40	20 04	20 35	21 19
S						

Lat.	Sunset	Twlt. ends	Moonset 1	2	3	4
N °	h m	h m	h m	h m	h m	h m
72	16 55	20 49	5 22	▬	▬	▬
70	17 04	20 33	6 00	5 30	▬	▬
68	17 11	20 20	6 27	6 19	6 07	▬
66	17 17	20 10	6 47	6 51	7 00	7 22
64	17 22	20 02	7 03	7 14	7 32	8 03
62	17 26	19 55	7 17	7 33	7 57	8 31
60	17 30	19 49	7 29	7 49	8 16	8 53
58	17 33	19 44	7 39	8 02	8 32	9 11
56	17 36	19 40	7 48	8 13	8 45	9 26
54	17 39	19 37	7 55	8 23	8 57	9 38
52	17 42	19 34	8 03	8 32	9 07	9 50
50	17 44	19 32	8 09	8 40	9 17	10 00
45	17 49	19 27	8 23	8 57	9 36	10 21
40	17 53	19 23	8 34	9 11	9 52	10 38
35	17 57	19 21	8 44	9 23	10 06	10 52
30	18 00	19 20	8 53	9 34	10 17	11 04
20	18 06	19 19	9 07	9 52	10 38	11 26
10	18 11	19 21	9 20	10 07	10 55	11 44
0	18 16	19 25	9 33	10 22	11 12	12 01
10	18 20	19 31	9 45	10 37	11 28	12 18
20	18 26	19 40	9 58	10 52	11 46	12 37
30	18 32	19 54	10 13	11 11	12 06	12 58
35	18 36	20 03	10 22	11 21	12 18	13 10
40	18 40	20 14	10 32	11 33	12 31	13 25
45	18 45	20 29	10 44	11 48	12 48	13 42
50	18 51	20 48	10 58	12 05	13 07	14 02
52	18 54	20 58	11 05	12 14	13 17	14 12
54	18 57	21 09	11 12	12 23	13 28	14 24
56	19 00	21 22	11 20	12 33	13 40	14 36
58	19 04	21 38	11 30	12 46	13 54	14 51
60	19 08	21 58	11 41	13 00	14 10	15 09
S						

GMT	Equation of Time (App.—Mean) 1	2	3
h	m s	m s	m s
0	− 12 30.2	− 12 18.3	− 12 05.9
6	− 12 27.2	− 12 15.2	− 12 02.8
12	− 12 24.3	− 12 12.2	− 11 59.6
18	− 12 21.3	− 12 09.1	− 11 56.4
24	− 12 18.3	− 12 05.9	− 11 53.1

DAY	GMT of Transit Meridian of Greenwich Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
1	3 21	14 46	7 28	23 11	5 28
2	4 10	14 46	7 27	23 06	5 25
3	5 00	14 47	7 26	23 02	5 21
4	5 49	14 47	7 25	22 57	5 17

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb **Add**	Venus **Add**	Mars **Add**
°	′	′	′
0	0.5	0.1	0.1
30	0.5	0.1	0.1
45	0.5	0.1	0.1
60	0.5	0.1	0.0
75	0.5	0.1	0.0
90	0.5	0.0	0.0

Moon's Lower Limb **Add**

Alt.	1	2	3
°	′	′	′
0	14.7	13.8	13.0
4	14.7	13.8	13.0
8	14.7	13.8	13.0
12	14.7	13.8	13.1
16	14.7	13.8	13.1
20	14.7	13.9	13.2
24	14.7	13.9	13.2
28	14.8	14.0	13.3
32	14.8	14.0	13.3
36	14.8	14.1	13.4
40	14.8	14.1	13.5
44	14.9	14.2	13.6
48	14.9	14.3	13.7
52	14.9	14.3	13.8
56	15.0	14.4	13.9
60	15.0	14.5	14.1
64	15.1	14.6	14.2
68	15.1	14.7	14.3
72	15.2	14.8	14.5
76	15.2	14.9	14.6
80	15.3	15.0	14.7
84	15.3	15.1	14.9
88	15.3	15.1	15.0
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	1	2	3
°	′	′	′
0	16.1	16.6	17.0
4	16.1	16.6	17.0
8	16.0	16.5	17.0
12	16.0	16.5	16.9
16	16.0	16.5	16.9
20	16.0	16.5	16.9
24	16.0	16.4	16.8
28	16.0	16.4	16.7
32	15.9	16.3	16.7
36	15.9	16.3	16.6
40	15.9	16.2	16.5
44	15.8	16.1	16.4
48	15.8	16.1	16.3
52	15.8	16.0	16.2
56	15.7	15.9	16.1
60	15.7	15.8	15.9
64	15.6	15.7	15.8
68	15.6	15.6	15.7
72	15.6	15.6	15.6
76	15.5	15.5	15.4
80	15.5	15.4	15.3
84	15.4	15.3	15.1
88	15.4	15.2	15.0
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.7 GHA	VENUS −3.7 Dec.	MARS 1.1 GHA	MARS 1.1 Dec.	JUPITER −2.0 GHA	JUPITER −2.0 Dec.	SATURN 0.6 GHA	SATURN 0.6 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
4 00	161 43.7	138 20.0	+10 31.5	248 45.0	−23 36.4	14 37.8	+14 30.1	280 35.7	−18 38.4	275 35.8	111	−22 02.9	− 22
01	176 46.2	153 19.8	32.7	263 45.7	36.4	29 40.6	30.2	295 38.1	38.4	290 05.9	110	22 05.1	− 20
02	191 48.7	168 19.6	34.0	278 46.4	36.4	44 43.3	30.3	310 40.6	38.4	304 35.9	111	22 07.1	− 20
03	206 51.1	183 19.4	·· 35.2	293 47.0	·· 36.5	59 46.1	·· 30.4	325 43.0	·· 38.4	319 06.0	111	·22 09.1	− 18
04	221 53.6	198 19.2	36.4	308 47.7	36.5	74 48.8	30.5	340 45.4	38.4	333 36.1	111	22 10.9	− 18
05	236 56.1	213 19.0	. 37.6	323 48.4	36.5	89 51.6	30.6	355 47.9	38.4	348 06.2	111	22 12.7	− 16
06	251 58.5	228 18.8	+10 38.8	338 49.1	−23 36.5	104 54.3	+14 30.7	10 50.3	−18 38.4	2 36.3	111	−22 14.3	− 15
07	267 01.0	243 18.6	40.0	353 49.7	36.5	119 57.1	30.8	25 52.7	38.4	17 06.4	111	22 15.8	− 14
08	282 03.5	258 18.4	41.2	8 50.4	36.5	134 59.8	30.9	40 55.1	38.4	31 36.5	111	22 17.2	− 13
09	297 05.9	273 18.2	·· 42.5	23 51.1	·· 36.5	150 02.6	·· 31.0	55 57.6	·· 38.4	46 06.6	111	·22 18.5	− 12
10	312 08.4	288 18.0	43.7	38 51.8	36.5	165 05.3	31.1	71 00.0	38.4	60 36.7	111	22 19.7	− 11
11	327 10.9	303 17.8	44.9	53 52.4	36.5	180 08.1	31.2	86 02.4	38.4	75 06.8	112	22 20.8	− 10
12	342 13.3	318 17.6	+10 46.1	68 53.1	−23 36.5	195 10.9	+14 31.3	101 04.9	−18 38.4	89 37.0	111	−22 21.8	− 9
13	357 15.8	333 17.4	47.3	83 53.8	36.5	210 13.6	31.4	116 07.3	38.4	104 07.1	112	22 22.7	− 7
14	12 18.2	348 17.2	48.5	98 54.5	36.5	225 16.4	31.5	131 09.7	38.4	118 37.3	112	22 23.4	− 7
15	27 20.7	3 17.0	·· 49.7	113 55.1	·· 36.5	240 19.1	·· 31.6	146 12.1	·· 38.4	133 07.5	112	·22 24.1	− 6
16	42 23.2	18 16.8	50.9	128 55.8	36.5	255 21.9	31.7	161 14.6	38.4	147 37.7	112	22 24.7	− 4
17	57 25.6	33 16.5	52.1	143 56.5	36.5	270 24.6	31.8	176 17.0	38.4	162 07.9	112	22 25.1	− 3
18	72 28.1	48 16.3	+10 53.4	158 57.2	−23 36.5	285 27.4	+14 31.9	191 19.4	−18 38.4	176 38.1	112	−22 25.4	− 3
19	87 30.6	63 16.1	54.6	173 57.8	36.5	300 30.1	32.0	206 21.9	38.4	191 08.3	112	22 25.7	− 1
20	102 33.0	78 15.9	55.8	188 58.5	36.5	315 32.9	32.1	221 24.3	38.4	205 38.5	113	22 25.8	0
21	117 35.5	93 15.7	·· 57.0	203 59.2	·· 36.6	330 35.6	·· 32.2	236 26.7	·· 38.4	220 08.8	113	·22 25.8	+ 1
22	132 38.0	108 15.5	58.2	218 59.9	36.6	345 38.4	32.3	251 29.2	38.4	234 39.1	112	22 25.7	+ 2
23	147 40.4	123 15.3	10 59.4	234 00.5	36.6	0 41.1	32.4	266 31.6	38.4	249 09.3	113	22 25.5	+ 3
5 00	162 42.9	138 15.1	+11 00.6	249 01.2	−23 36.6	15 43.9	+14 32.5	281 34.0	−18 38.4	263 39.6	114	−22 25.2	+ 4
01	177 45.3	153 14.9	01.8	264 01.9	36.6	30 46.6	32.6	296 36.4	38.4	278 10.0	113	22 24.8	+ 5
02	192 47.8	168 14.7	03.0	279 02.6	36.6	45 49.4	32.7	311 38.9	38.4	292 40.3	113	22 24.3	+ 6
03	207 50.3	183 14.5	·· 04.2	294 03.2	·· 36.6	60 52.1	·· 32.8	326 41.3	·· 38.4	307 10.6	114	·22 23.7	+ 7
04	222 52.7	198 14.3	05.4	309 03.9	36.6	75 54.9	32.9	341 43.7	38.4	321 41.0	114	22 23.0	+ 8
05	237 55.2	213 14.1	06.6	324 04.6	36.6	90 57.6	33.0	356 46.2	38.4	336 11.4	113	22 22.2	+ 10
06	252 57.7	228 13.9	+11 07.8	339 05.3	−23 36.6	106 00.4	+14 33.1	11 48.6	−18 38.4	350 41.7	115	−22 21.2	+ 10
07	268 00.1	243 13.7	09.0	354 05.9	36.6	121 03.1	33.2	26 51.0	38.4	5 12.2	114	22 20.2	+ 11
08	283 02.6	258 13.5	10.2	9 06.6	36.6	136 05.9	33.3	41 53.5	38.4	19 42.6	114	22 19.1	+ 13
09	298 05.1	273 13.3	·· 11.4	24 07.3	·· 36.6	151 08.6	·· 33.4	56 55.9	·· 38.4	34 13.0	115	·22 17.8	+ 13
10	313 07.5	288 13.1	12.6	39 08.0	36.6	166 11.4	33.5	71 58.3	38.4	48 43.5	115	22 16.5	+ 15
11	328 10.0	303 12.9	13.8	54 08.6	36.6	181 14.1	33.6	87 00.8	38.4	63 14.0	115	22 15.0	+ 15
12	343 12.5	318 12.7	+11 15.1	69 09.3	−23 36.6	196 16.8	+14 33.7	102 03.2	−18 38.4	77 44.5	115	−22 13.5	+ 17
13	358 14.9	333 12.5	16.3	84 10.0	36.6	211 19.6	33.8	117 05.6	38.4	92 15.0	116	22 11.8	+ 18
14	13 17.4	348 12.3	17.5	99 10.7	36.6	226 22.3	33.9	132 08.1	38.4	106 45.6	115	22 10.0	+ 18
15	28 19.8	3 12.1	·· 18.7	114 11.4	·· 36.5	241 25.1	·· 34.0	147 10.5	·· 38.4	121 16.1	116	·22 08.2	+ 20
16	43 22.3	18 11.9	19.9	129 12.0	36.5	256 27.8	34.1	162 12.9	38.4	135 46.7	116	22 06.2	+ 21
17	58 24.8	33 11.7	21.1	144 12.7	36.5	271 30.6	34.2	177 15.4	38.4	150 17.3	116	22 04.1	+ 22
18	73 27.2	48 11.5	+11 22.3	159 13.4	−23 36.5	286 33.3	+14 34.3	192 17.8	−18 38.4	164 47.9	117	−22 01.9	+ 22
19	88 29.7	63 11.3	23.5	174 14.1	36.5	301 36.1	34.3	207 20.2	38.4	179 18.6	117	21 59.7	+ 24
20	103 32.2	78 11.1	24.6	189 14.7	36.5	316 38.8	34.4	222 22.7	38.4	193 49.3	117	21 57.3	+ 25
21	118 34.6	93 10.8	·· 25.8	204 15.4	·· 36.5	331 41.6	·· 34.5	237 25.1	·· 38.3	208 20.0	117	·21 54.8	+ 26
22	133 37.1	108 10.6	27.0	219 16.1	36.5	346 44.3	34.6	252 27.5	38.3	222 50.7	117	21 52.2	+ 27
23	148 39.6	123 10.4	28.2	234 16.8	36.5	1 47.1	34.7	267 30.0	38.3	237 21.4	118	21 49.5	+ 27
6 00	163 42.0	138 10.2	+11 29.4	249 17.4	−23 36.5	16 49.8	+14 34.8	282 32.4	−18 38.3	251 52.2	118	−21 46.8	+ 29
01	178 44.5	153 10.0	30.6	264 18.1	36.5	31 52.6	34.9	297 34.8	38.3	266 23.0	118	21 43.9	+ 30
02	193 47.0	168 09.8	31.8	279 18.8	36.5	46 55.3	35.0	312 37.3	38.3	280 53.8	118	21 40.9	+ 31
03	208 49.4	183 09.6	·· 33.0	294 19.5	·· 36.5	61 58.0	·· 35.1	327 39.7	·· 38.3	295 24.6	119	·21 37.8	+ 32
04	223 51.9	198 09.4	34.2	309 20.1	36.5	77 00.8	35.2	342 42.2	38.3	309 55.5	119	21 34.6	+ 32
05	238 54.3	213 09.2	35.4	324 20.8	36.5	92 03.5	35.3	357 44.6	38.3	324 26.4	119	21 31.4	+ 34
06	253 56.8	228 09.0	+11 36.6	339 21.5	−23 36.5	107 06.3	+14 35.4	12 47.0	−18 38.3	338 57.3	119	−21 28.0	+ 35
07	268 59.3	243 08.8	37.8	354 22.2	36.5	122 09.0	35.5	27 49.5	38.3	353 28.2	120	21 24.5	+ 36
08	284 01.7	258 08.6	39.0	9 22.8	36.4	137 11.8	35.6	42 51.9	38.3	7 59.2	120	21 20.9	+ 36
09	299 04.2	273 08.4	·· 40.2	24 23.5	·· 36.4	152 14.5	·· 35.7	57 54.3	·· 38.3	22 30.2	120	·21 17.3	+ 38
10	314 06.7	288 08.2	41.4	39 24.2	36.4	167 17.3	35.8	72 56.8	38.3	37 01.2	120	21 13.5	+ 39
11	329 09.1	303 08.0	42.6	54 24.9	36.4	182 20.0	35.9	87 59.2	38.3	51 32.2	121	21 09.6	+ 39
12	344 11.6	318 07.8	+11 43.8	69 25.5	−23 36.4	197 22.7	+14 36.0	103 01.6	−18 38.3	66 03.3	121	−21 05.7	+ 41
13	359 14.1	333 07.6	45.0	84 26.2	36.4	212 25.5	36.1	118 04.1	38.3	80 34.4	121	21 01.6	+ 42
14	14 16.5	348 07.4	46.1	99 26.9	36.4	227 28.2	36.2	133 06.5	38.3	95 05.5	122	20 57.4	+ 42
15	29 19.0	3 07.1	·· 47.3	114 27.6	·· 36.4	242 31.0	·· 36.3	148 09.0	·· 38.3	109 36.7	121	·20 53.2	+ 44
16	44 21.4	18 06.9	48.5	129 28.2	36.4	257 33.7	36.4	163 11.4	38.3	124 07.8	122	20 48.8	+ 44
17	59 23.9	33 06.7	49.7	144 28.9	36.4	272 36.5	36.5	178 13.8	38.3	138 39.0	123	20 44.4	+ 45
18	74 26.4	48 06.5	+11 50.9	159 29.6	−23 36.3	287 39.2	+14 36.6	193 16.3	−18 38.3	153 10.3	122	−20 39.9	+ 47
19	89 28.8	63 06.3	52.1	174 30.3	36.3	302 41.9	36.6	208 18.7	38.3	167 41.5	123	20 35.2	+ 47
20	104 31.3	78 06.1	53.3	189 31.0	36.3	317 44.7	36.7	223 21.2	38.3	182 12.8	123	20 30.5	+ 48
21	119 33.8	93 05.9	·· 54.5	204 31.6	·· 36.3	332 47.4	·· 36.8	238 23.6	·· 38.3	196 44.1	124	·20 25.7	+ 49
22	134 36.2	108 05.7	55.7	219 32.3	36.3	347 50.2	36.9	253 26.0	38.3	211 15.5	123	20 20.8	+ 50
23	149 38.7	123 05.5	56.8	234 33.0	36.3	2 52.9	37.0	268 28.5	38.3	225 46.8	124	20 15.8	+ 51
24	164 41.2	138 05.3	+11 58.0	249 33.7	−23 36.3	17 55.7	+14 37.1	283 30.9	−18 38.3	240 18.2	125	−20 10.7	+ 52
code	—	− 2	+ 12	+ 7	0	+ 28	+ 1	+ 24	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
4 0	177 01.8	− 6 31.7
1	192 01.9	30.7
2	207 02.1	29.7
3	222 02.2	28.8
4	237 02.3	27.8
5	252 02.5	26.9
6	267 02.6	− 6 25.9
7	282 02.7	24.9
8	297 02.9	24.0
9	312 03.0	23.0
10	327 03.2	22.0
11	342 03.3	21.1
12	357 03.4	− 6 20.1
13	12 03.6	19.2
14	27 03.7	18.2
15	42 03.9	17.2
16	57 04.0	16.3
17	72 04.1	15.3
18	87 04.3	− 6 14.3
19	102 04.4	13.4
20	117 04.5	12.4
21	132 04.7	11.4
22	147 04.8	10.5
23	162 05.0	09.5
5 0	177 05.1	− 6 08.6
1	192 05.2	07.6
2	207 05.4	06.6
3	222 05.5	05.7
4	237 05.7	04.7
5	252 05.8	03.7
6	267 06.0	− 6 02.8
7	282 06.1	01.8
8	297 06.2	6 00.8
9	312 06.4	5 59.9
10	327 06.5	58.9
11	342 06.7	57.9
12	357 06.8	− 5 57.0
13	12 06.9	56.0
14	27 07.1	55.0
15	42 07.2	54.1
16	57 07.4	53.1
17	72 07.5	52.1
18	87 07.7	− 5 51.2
19	102 07.8	50.2
20	117 08.0	49.2
21	132 08.1	48.3
22	147 08.2	47.3
23	162 08.4	46.3
6 0	177 08.5	− 5 45.3
1	192 08.7	44.4
2	207 08.8	43.4
3	222 09.0	42.4
4	237 09.1	41.5
5	252 09.3	40.5
6	267 09.4	− 5 39.5
7	282 09.5	38.6
8	297 09.7	37.6
9	312 09.8	36.6
10	327 10.0	35.7
11	342 10.1	34.7
12	357 10.3	− 5 33.7
13	12 10.4	32.7
14	27 10.6	31.8
15	42 10.7	30.8
16	57 10.9	29.8
17	72 11.0	28.9
18	87 11.2	− 5 27.9
19	102 11.3	26.9
20	117 11.5	25.9
21	132 11.6	25.0
22	147 11.8	24.0
23	162 11.9	23.0
24	177 12.1	− 5 22.1
code	−	+ 10

STARS No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 51.1	− 40 29.0
5	Achernar	335 59.0	− 57 27.7
30	Acrux	173 56.8	− 62 51.5
19	Adhara	255 46.1	− 28 55.0
10	Aldebaran	291 38.7	+ 16 25.3
32	Alioth	166 57.7	+ 56 11.5
34	Alkaid	153 32.3	+ 49 31.6
55	Al Na'ir	28 38.0	− 47 10.4
15	Alnilam	276 29.9	− 1 13.9
25	Alphard	218 38.0	− 8 28.3
41	Alphecca	126 47.2	+ 26 51.4
1	Alpheratz	358 28.3	+ 28 51.0
51	Altair	62 50.3	+ 8 45.0
2	Ankaa	353 58.3	− 42 32.7
42	Antares	113 18.9	− 26 20.2
37	Arcturus	146 34.6	+ 19 24.3
43	Atria	108 59.3	− 68 56.8
22	Avior	234 35.1	− 59 22.4
13	Bellatrix	279 18.0	+ 6 18.6
16	Betelg'se	271 47.7	+ 7 23.9
17	Canopus	264 15.0	− 52 40.6
12	Capella	281 37.9	+ 45 57.5
53	Deneb	50 01.1	+ 45 07.3
28	Denebola	183 17.1	+ 14 48.8
4	Diphda	349 39.2	− 18 13.7
27	Dubhe	194 43.5	+ 61 59.1
14	Elnath	279 06.8	+ 28 34.4
47	Eltanin	91 06.2	+ 51 29.3
54	Enif	34 29.5	+ 9 40.4
56	Fomalhaut	16 11.6	− 29 51.3
31	Gacrux	172 48.3	− 56 52.2
29	Gienah	176 36.2	− 17 18.1
35	Hadar	149 48.5	− 60 09.7
6	Hamal	328 49.5	+ 23 15.4
48	Kaus Aust.	84 40.8	− 34 24.3
40	Kochab	137 17.4	+ 74 19.7
57	Markab	14 21.4	+ 14 58.1
8	Menkar	315 00.1	+ 3 55.1
36	Menkent	148 58.0	− 36 09.4
24	Miapl'dus	221 48.1	− 69 32.5
9	Mirfak	309 42.1	+ 49 42.6
50	Nunki	76 51.6	− 26 21.1
52	Peacock	54 27.2	− 56 52.5
21	Pollux	244 19.9	+ 28 07.9
20	Procyon	245 44.4	+ 5 20.1
46	R'alhague	96 46.3	+ 12 35.3
26	Regulus	208 28.8	+ 12 10.7
11	Rigel	281 53.3	− 8 15.2
38	Rigil Kent.	140 50.1	− 60 39.3
44	Sabik	103 01.8	− 15 40.4
3	Schedar	350 30.1	+ 56 18.0
45	Shaula	97 20.3	− 37 04.3
18	Sirius	259 11.4	− 16 39.5
33	Spica	159 16.3	− 10 56.2
23	Suhail	223 23.7	− 43 15.6
49	Vega	81 08.2	+ 38 44.3
39	Zub'g'bi	137 52.8	− 15 51.8

GMT	Equation of Time (App.—Mean) 4 m s	5 m s	6 m s
h			
0	− 11 53.1	− 11 39.9	− 11 26.2
6	− 11 49.8	− 11 36.5	− 11 22.7
12	− 11 46.5	− 11 33.1	− 11 19.2
18	− 11 43.2	− 11 29.6	− 11 15.7
24	− 11 39.9	− 11 26.2	− 11 12.1

Lat. N °	Sunrise h m	Twlt. begins h m	Moonrise 4 h m	5 h m	6 h m	7 h m
72	7 16	3 24	▬	▬	▬	▬
70	7 09	3 42	▬	▬	▬	7 25
68	7 03	3 57	▬	▬	6 35	6 20
66	6 58	4 08	4 14	5 09	5 34	5 45
64	6 54	4 16	3 33	4 26	5 00	5 19
62	6 50	4 24	3 05	3 58	4 35	4 59
60	6 47	4 30	2 44	3 36	4 15	4 43
58	6 44	4 36	2 26	3 18	3 58	4 29
56	6 41	4 40	2 11	3 03	3 44	4 17
54	6 39	4 44	1 59	2 50	3 32	4 06
52	6 37	4 46	1 47	2 39	3 22	3 57
50	6 35	4 49	1 38	2 29	3 12	3 49
45	6 31	4 55	1 17	2 08	2 52	3 31
40	6 27	4 59	1 00	1 51	2 36	3 16
35	6 24	5 02	0 46	1 36	2 22	3 04
30	6 22	5 04	0 33	1 24	2 10	2 53
20	6 17	5 05	0 12	1 02	1 50	2 35
10	6 12	5 03	24 44	0 44	1 32	2 18
0	6 08	4 59	24 27	0 27	1 15	2 03
10	6 04	4 54	24 09	0 09	0 59	1 48
20	5 59	4 45	23 51	24 41	0 41	1 32
30	5 54	4 32	23 30	24 20	0 20	1 13
35	5 51	4 23	23 17	24 08	0 08	1 02
40	5 47	4 12	23 03	23 55	24 49	0 49
45	5 43	3 58	22 46	23 38	24 35	0 35
50	5 37	3 40	22 25	23 18	24 16	0 16
52	5 35	3 30	22 15	23 08	24 08	0 08
54	5 32	3 20	22 04	22 57	23 58	25 03
56	5 29	3 07	21 51	22 45	23 47	24 54
58	5 26	2 53	21 36	22 31	23 35	24 44
60	5 22	2 34	21 19	22 14	23 20	24 32
S						

Lat. N °	Sunset h m	Twlt. ends h m	Moonset 4 h m	5 h m	6 h m	7 h m
72	17 09	21 07	▬	▬	▬	▬
70	17 16	20 47	▬	▬	▬	9 14
68	17 22	20 33	▬	▬	8 25	10 18
66	17 27	20 21	7 22	8 10	9 25	10 53
64	17 31	20 12	8 03	8 52	9 59	11 18
62	17 34	20 03	8 31	9 21	10 24	11 37
60	17 38	19 58	8 53	9 43	10 44	11 53
58	17 40	19 52	9 11	10 00	11 00	12 07
56	17 43	19 47	9 26	10 15	11 13	12 18
54	17 45	19 43	9 38	10 28	11 25	12 29
52	17 47	19 40	9 50	10 39	11 36	12 38
50	17 49	19 37	10 00	10 49	11 45	12 46
45	17 53	19 31	10 21	11 10	12 05	13 03
40	17 56	19 26	10 38	11 27	12 20	13 17
35	17 59	19 23	10 52	11 41	12 34	13 28
30	18 02	19 21	11 04	11 54	12 45	13 39
20	18 07	19 20	11 26	12 15	13 05	13 56
10	18 11	19 21	11 44	12 33	13 23	14 12
0	18 15	19 24	12 01	12 50	13 39	14 26
10	18 19	19 29	12 18	13 07	13 55	14 40
20	18 24	19 38	12 37	13 26	14 12	14 55
30	18 29	19 50	12 58	13 47	14 31	15 12
35	18 32	19 58	13 10	13 59	14 43	15 22
40	18 36	20 10	13 25	14 13	14 56	15 34
45	18 40	20 23	13 42	14 29	15 11	15 47
50	18 45	20 40	14 02	14 50	15 30	16 03
52	18 47	20 49	14 12	15 00	15 39	16 11
54	18 50	21 00	14 24	15 11	15 49	16 19
56	18 52	21 11	14 36	15 23	16 00	16 29
58	18 56	21 26	14 51	15 37	16 13	16 39
60	18 59	21 43	15 09	15 54	16 28	16 52

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
4	5 49	14 47	7 25	22 57	5 17
5	6 39	14 47	7 24	22 53	5 13
6	7 27	14 48	7 23	22 49	5 09
7	8 14	14 48	7 21	22 44	5 05

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.4	0.1	0.1
30	0.4	0.1	0.1
45	0.4	0.1	0.1
60	0.4	0.1	0.0
75	0.4	0.0	0.0
90			

Moon's Lower Limb Add

Alt. °	4 ′	5 ′	6 ′
0	12.4	12.1	12.0
4	12.4	12.1	12.0
8	12.4	12.1	12.0
12	12.4	12.2	12.0
16	12.4	12.2	12.1
20	12.5	12.2	12.1
24	12.6	12.3	12.2
28	12.6	12.4	12.3
32	12.7	12.5	12.4
36	12.8	12.6	12.5
40	12.9	12.7	12.6
44	13.0	12.8	12.7
48	13.1	12.9	12.8
52	13.3	13.1	13.0
56	13.4	13.2	13.1
60	13.5	13.4	13.3
64	13.7	13.5	13.5
68	13.9	13.7	13.6
72	14.0	13.9	13.8
76	14.2	14.1	14.0
80	14.4	14.3	14.2
84	14.5	14.4	14.4
88	14.7	14.6	14.6
90	14.8	14.8	14.7

Add to table, back cover

Moon's Upper Limb Subtract

Alt. °	4 ′	5 ′	6 ′
0	17.4	17.5	17.6
4	17.4	17.5	17.6
8	17.3	17.5	17.5
12	17.3	17.4	17.5
16	17.2	17.4	17.5
20	17.2	17.3	17.4
24	17.1	17.2	17.3
28	17.0	17.2	17.2
32	16.9	17.1	17.1
36	16.8	16.9	17.0
40	16.7	16.8	16.9
44	16.6	16.7	16.7
48	16.5	16.6	16.6
52	16.3	16.4	16.4
56	16.2	16.2	16.3
60	16.0	16.1	16.1
64	15.9	15.9	15.9
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.2
84	15.0	15.0	15.0
88	14.9	14.9	14.8
90			

Subtract from table, back cover

Last Quarter 4

GMT	♈ GHA	VENUS −3.7 GHA	VENUS −3.7 Dec.	MARS 1.1 GHA	MARS 1.1 Dec.	JUPITER −2.0 GHA	JUPITER −2.0 Dec.	SATURN 0.6 GHA	SATURN 0.6 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
7 00	164 41.2	138 05.3	+11 58.0	249 33.7	−23 36.3	17 55.7	+14 37.1	283 30.9	−18 38.3	240 18.2	125	−20 10.7	+ 52
01	179 43.6	153 05.1	11 59.2	264 34.3	36.3	32 58.4	37.2	298 33.4	38.3	254 49.7	124	20 05.5	+ 53
02	194 46.1	168 04.9	12 00.4	279 35.0	36.2	48 01.1	37.3	313 35.8	38.3	269 21.1	125	20 00.2	+ 53
03	209 48.6	183 04.7	01.6	294 35.7	36.2	63 03.9	37.4	328 38.2	38.3	283 52.6	125	·19 54.9	+ 55
04	224 51.0	198 04.5	02.8	309 36.4	36.2	78 06.6	37.5	343 40.7	38.3	298 24.1	126	19 49.4	+ 55
05	239 53.5	213 04.2	03.9	324 37.0	36.2	93 09.4	37.6	358 43.1	38.3	312 55.7	125	19 43.9	+ 57
06	254 55.9	228 04.0	+12 05.1	339 37.7	−23 36.2	108 12.1	+14 37.7	13 45.6	−18 38.3	327 27.2	126	−19 38.2	+ 57
07	269 58.4	243 03.8	06.3	354 38.4	36.2	123 14.8	37.8	28 48.0	38.3	341 58.8	127	19 32.5	+ 58
08	285 00.9	258 03.6	07.5	9 39.1	36.2	138 17.6	37.9	43 50.4	38.3	356 30.5	126	19 26.7	+ 59
09	300 03.3	273 03.4	08.7	24 39.7	36.1	153 20.3	38.0	58 52.9	38.3	11 02.1	127	·19 20.8	+ 60
10	315 05.8	288 03.2	09.9	39 40.4	36.1	168 23.1	38.1	73 55.3	38.3	25 33.8	127	19 14.8	+ 61
11	330 08.3	303 03.0	11.0	54 41.1	36.1	183 25.8	38.2	88 57.8	38.3	40 05.5	127	19 08.7	+ 61
12	345 10.7	318 02.8	+12 12.2	69 41.8	−23 36.1	198 28.6	+14 38.2	104 00.2	−18 38.3	54 37.2	128	−19 02.6	+ 63
13	0 13.2	333 02.6	13.4	84 42.5	36.1	213 31.3	38.3	119 02.7	38.2	69 09.0	128	18 56.3	+ 63
14	15 15.7	348 02.4	14.6	99 43.1	36.0	228 34.0	38.4	134 05.1	38.2	83 40.8	128	18 50.0	+ 64
15	30 18.1	3 02.2	15.8	114 43.8	36.0	243 36.8	38.5	149 07.5	38.2	98 12.6	129	·18 43.6	+ 65
16	45 20.6	18 02.0	16.9	129 44.5	36.0	258 39.5	38.6	164 10.0	38.2	112 44.5	129	18 37.1	+ 66
17	60 23.1	33 01.8	18.1	144 45.2	36.0	273 42.2	38.7	179 12.4	38.2	127 16.4	129	18 30.5	+ 67
18	75 25.5	48 01.5	+12 19.3	159 45.8	−23 36.0	288 45.0	+14 38.8	194 14.9	−18 38.2	141 48.3	129	−18 23.8	+ 68
19	90 28.0	63 01.3	20.5	174 46.5	36.0	303 47.7	38.9	209 17.3	38.2	156 20.2	130	18 17.0	+ 68
20	105 30.4	78 01.1	21.6	189 47.2	35.9	318 50.5	39.0	224 19.8	38.2	170 52.2	130	18 10.2	+ 69
21	120 32.9	93 00.9	22.8	204 47.9	35.9	333 53.2	39.1	239 22.2	38.2	185 24.2	130	·18 03.3	+ 70
22	135 35.4	108 00.7	24.0	219 48.5	35.9	348 55.9	39.2	254 24.6	38.2	199 56.2	131	17 56.3	+ 71
23	150 37.8	123 00.5	25.2	234 49.2	35.9	3 58.7	39.3	269 27.1	38.2	214 28.3	131	17 49.2	+ 72
8 00	165 40.3	138 00.3	+12 26.3	249 49.9	−23 35.9	19 01.4	+14 39.4	284 29.5	−18 38.2	229 00.4	131	−17 42.0	+ 72
01	180 42.8	153 00.1	27.5	264 50.6	35.8	34 04.1	39.5	299 32.0	38.2	243 32.5	131	17 34.8	+ 74
02	195 45.2	167 59.9	28.7	279 51.2	35.8	49 06.9	39.6	314 34.4	38.2	258 04.6	132	17 27.4	+ 74
03	210 47.7	182 59.7	29.9	294 51.9	35.8	64 09.6	39.6	329 36.9	38.2	272 36.8	132	·17 20.0	+ 74
04	225 50.2	197 59.4	31.0	309 52.6	35.8	79 12.4	39.7	344 39.3	38.2	287 09.0	132	17 12.6	+ 76
05	240 52.6	212 59.2	32.2	324 53.3	35.7	94 15.1	39.8	359 41.8	38.2	301 41.2	132	17 05.0	+ 77
06	255 55.1	227 59.0	+12 33.4	339 54.0	−23 35.7	109 17.8	+14 39.9	14 44.2	−18 38.2	316 13.4	133	−16 57.3	+ 77
07	270 57.5	242 58.8	34.6	354 54.6	35.7	124 20.6	40.0	29 46.6	38.2	330 45.7	133	16 49.6	+ 78
08	286 00.0	257 58.6	35.7	9 55.3	35.7	139 23.3	40.1	44 49.1	38.2	345 18.0	133	16 41.8	+ 78
09	301 02.5	272 58.4	36.9	24 56.0	35.7	154 26.0	40.2	59 51.5	38.2	359 50.3	134	·16 34.0	+ 80
10	316 04.9	287 58.2	38.1	39 56.7	35.6	169 28.8	40.3	74 54.0	38.2	14 22.7	133	16 26.0	+ 80
11	331 07.4	302 58.0	39.2	54 57.3	35.6	184 31.5	40.4	89 56.4	38.2	28 55.0	135	16 18.0	+ 81
12	346 09.9	317 57.8	+12 40.4	69 58.0	−23 35.6	199 34.3	+14 40.5	104 58.9	−18 38.2	43 27.5	134	−16 09.9	+ 82
13	1 12.3	332 57.6	41.6	84 58.7	35.6	214 37.0	40.6	120 01.3	38.2	57 59.9	134	16 01.7	+ 82
14	16 14.8	347 57.3	42.7	99 59.4	35.5	229 39.7	40.7	135 03.8	38.2	72 32.3	135	15 53.5	+ 84
15	31 17.3	2 57.1	43.9	115 00.1	35.5	244 42.5	40.7	150 06.2	38.2	87 04.8	135	·15 45.1	+ 83
16	46 19.7	17 56.9	45.1	130 00.7	35.5	259 45.2	40.8	165 08.7	38.2	101 37.3	135	15 36.8	+ 85
17	61 22.2	32 56.7	46.2	145 01.4	35.4	274 47.9	40.9	180 11.1	38.1	116 09.8	136	15 28.3	+ 85
18	76 24.7	47 56.5	+12 47.4	160 02.1	−23 35.4	289 50.7	+14 41.0	195 13.6	−18 38.1	130 42.4	136	−15 19.8	+ 87
19	91 27.1	62 56.3	48.6	175 02.8	35.4	304 53.4	41.1	210 16.0	38.1	145 15.0	136	15 11.1	+ 86
20	106 29.6	77 56.1	49.7	190 03.4	35.4	319 56.1	41.2	225 18.4	38.1	159 47.6	136	15 02.5	+ 88
21	121 32.0	92 55.9	50.9	205 04.1	35.3	334 58.9	41.3	240 20.9	38.1	174 20.2	136	·14 53.7	+ 88
22	136 34.5	107 55.6	52.1	220 04.8	35.3	350 01.6	41.4	255 23.3	38.1	188 52.8	137	14 44.9	+ 89
23	151 37.0	122 55.4	53.2	235 05.5	35.3	5 04.3	41.5	270 25.8	38.1	203 25.5	137	14 36.0	+ 89
9 00	166 39.4	137 55.2	+12 54.4	250 06.2	−23 35.3	20 07.1	+14 41.6	285 28.2	−18 38.1	217 58.2	137	−14 27.1	+ 90
01	181 41.9	152 55.0	55.6	265 06.8	35.2	35 09.8	41.7	300 30.7	38.1	232 30.9	137	14 18.1	+ 91
02	196 44.4	167 54.8	56.7	280 07.5	35.2	50 12.5	41.8	315 33.1	38.1	247 03.6	138	14 09.0	+ 92
03	211 46.8	182 54.6	57.9	295 08.2	35.2	65 15.3	41.8	330 35.6	38.1	261 36.4	137	·13 59.8	+ 92
04	226 49.3	197 54.4	12 59.0	310 08.9	35.1	80 18.0	41.9	345 38.0	38.1	276 09.1	138	13 50.6	+ 93
05	241 51.8	212 54.2	13 00.2	325 09.5	35.1	95 20.7	42.0	0 40.5	38.1	290 41.9	138	13 41.3	+ 93
06	256 54.2	227 54.0	+13 01.4	340 10.2	−23 35.1	110 23.5	+14 42.1	15 42.9	−18 38.1	305 14.7	139	−13 32.0	+ 95
07	271 56.7	242 53.7	02.5	355 10.9	35.0	125 26.2	42.2	30 45.4	38.1	319 47.6	138	13 22.5	+ 94
08	286 59.2	257 53.5	03.7	10 11.6	35.0	140 28.9	42.3	45 47.8	38.1	334 20.4	139	13 13.1	+ 96
09	302 01.6	272 53.3	04.8	25 12.3	35.0	155 31.7	42.4	60 50.3	38.1	348 53.3	139	·13 03.5	+ 96
10	317 04.1	287 53.1	06.0	40 12.9	35.0	170 34.4	42.5	75 52.7	38.1	3 26.2	139	12 53.9	+ 96
11	332 06.5	302 52.9	07.2	55 13.6	34.9	185 37.1	42.6	90 55.2	38.1	17 59.1	139	12 44.3	+ 97
12	347 09.0	317 52.7	+13 08.3	70 14.3	−23 34.9	200 39.8	+14 42.7	105 57.6	−18 38.1	32 32.0	140	−12 34.6	+ 98
13	2 11.5	332 52.5	09.5	85 15.0	34.9	215 42.6	42.7	121 00.1	38.1	47 05.0	139	12 24.8	+ 99
14	17 13.9	347 52.2	10.6	100 15.6	34.8	230 45.3	42.8	136 02.5	38.1	61 37.9	140	12 14.9	+ 99
15	32 16.4	2 52.0	11.8	115 16.3	34.8	245 48.0	42.9	151 05.0	38.1	76 10.9	140	·12 05.0	+ 99
16	47 18.9	17 51.8	12.9	130 17.0	34.8	260 50.8	43.0	166 07.4	38.0	90 43.9	140	11 55.1	+101
17	62 21.3	32 51.6	14.1	145 17.7	34.7	275 53.5	43.1	181 09.9	38.0	105 16.9	140	11 45.0	+100
18	77 23.8	47 51.4	+13 15.3	160 18.4	−23 34.7	290 56.2	+14 43.2	196 12.3	−18 38.0	119 49.9	140	−11 35.0	+102
19	92 26.3	62 51.2	16.4	175 19.0	34.7	305 59.0	43.3	211 14.8	38.0	134 22.9	141	11 24.8	+101
20	107 28.7	77 51.0	17.6	190 19.7	34.6	321 01.7	43.4	226 17.3	38.0	148 56.0	140	11 14.7	+103
21	122 31.2	92 50.8	18.7	205 20.4	34.6	336 04.4	43.5	241 19.7	38.0	163 29.0	141	·11 04.4	+103
22	137 33.6	107 50.5	19.9	220 21.1	34.5	351 07.1	43.6	256 22.2	38.0	178 02.1	141	10 54.1	+103
23	152 36.1	122 50.3	21.0	235 21.7	34.5	6 09.9	43.6	271 24.6	38.0	192 35.2	141	10 43.8	+104
24	167 38.6	137 50.1	+13 22.2	250 22.4	−23 34.5	21 12.6	+14 43.7	286 27.1	−18 38.0	207 08.3	141	−10 33.4	+105
code	−	− 2	+ 12	+ 7	0	+ 27	+ 1	+ 24	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
7 0	177 12.1	− 5 22.1	7	Acamar	315 51.1	−40 29.0
1	192 12.2	21.1	5	Achernar	335 59.1	−57 27.7
2	207 12.4	20.1	30	Acrux	173 56.7	−62 51.5
3	222 12.5	·· 19.1	19	Adhara	255 46.1	−28 55.0
4	237 12.6	18.2	10	Aldebaran	291 38.7	+16 25.3
5	252 12.8	17.2				
6	267 12.9	− 5 16.2	32	Alioth	166 57.7	+56 11.6
7	282 13.1	15.3	34	Alkaid	153 32.2	+49 31.6
8	297 13.2	14.3	55	Al Na'ir	28 37.9	−47 10.4
9	312 13.4	·· 13.3	15	Alnilam	276 29.9	− 1 13.9
10	327 13.5	12.3	25	Alphard	218 38.0	− 8 28.3
11	342 13.7	11.4				
12	357 13.9	− 5 10.4	41	Alphecca	126 47.2	+26 51.4
13	12 14.0	09.4	1	Alpheratz	358 28.3	+28 51.0
14	27 14.2	08.4	51	Altair	62 50.3	+ 8 45.0
15	42 14.3	·· 07.5	2	Ankaa	353 58.3	−42 32.7
16	57 14.5	06.5	42	Antares	113 18.9	−26 20.2
17	72 14.6	05.5				
18	87 14.8	− 5 04.5	37	Arcturus	146 34.6	+19 24.3
19	102 14.9	03.6	43	Atria	108 59.2	−68 56.8
20	117 15.1	02.6	22	Avior	234 35.2	−59 22.4
21	132 15.2	·· 01.6	13	Bellatrix	279 18.0	+ 6 18.6
22	147 15.4	5 00.7	16	Betelg'se	271 47.7	+ 7 23.9
23	162 15.5	4 59.7				
			17	Canopus	264 15.0	−52 40.6
8 0	177 15.7	− 4 58.7	12	Capella	281 37.9	+45 57.5
1	192 15.8	57.7	53	Deneb	50 01.1	+45 07.3
2	207 16.0	56.8	28	Denebola	183 17.0	+14 48.8
3	222 16.1	·· 55.8	4	Diphda	349 39.2	−18 13.7
4	237 16.3	54.8				
5	252 16.4	53.8	27	Dubhe	194 43.5	+61 59.1
6	267 16.6	− 4 52.9	14	Elnath	279 06.9	+28 34.4
7	282 16.7	51.9	47	Eltanin	91 06.2	+51 29.3
8	297 16.9	50.9	54	Enif	34 29.5	+ 9 40.4
9	312 17.1	·· 49.9	56	Fomalhaut	16 11.6	−29 51.3
10	327 17.2	49.0				
11	342 17.4	48.0	31	Gacrux	172 48.3	−56 52.2
12	357 17.5	− 4 47.0	29	Gienah	176 36.2	−17 18.1
13	12 17.7	46.0	35	Hadar	149 48.4	−60 09.7
14	27 17.8	45.0	6	Hamal	328 49.5	+23 15.4
15	42 18.0	·· 44.1	48	Kaus Aust.	84 40.8	−34 24.3
16	57 18.1	43.1				
17	72 18.3	42.1	40	Kochab	137 17.3	+74 19.7
18	87 18.4	− 4 41.1	57	Markab	14 21.4	+14 58.1
19	102 18.6	40.2	8	Menkar	315 00.1	+ 3 55.1
20	117 18.8	39.2	36	Menkent	148 58.0	−36 09.4
21	132 18.9	·· 38.2	24	Miapl'dus	221 48.2	−69 32.5
22	147 19.1	37.2				
23	162 19.2	36.3	9	Mirfak	309 42.1	+49 42.6
			50	Nunki	76 51.6	−26 21.1
9 0	177 19.4	− 4 35.3	52	Peacock	54 27.2	−56 52.4
1	192 19.5	34.3	21	Pollux	244 19.9	+28 07.9
2	207 19.7	33.3	20	Procyon	245 44.4	+ 5 20.1
3	222 19.9	·· 32.4				
4	237 20.0	31.4	46	R'alhague	96 46.3	+12 35.3
5	252 20.2	30.4	26	Regulus	208 28.8	+12 10.7
6	267 20.3	− 4 29.4	11	Rigel	281 53.3	− 8 15.2
7	282 20.5	28.4	38	Rigil Kent.	140 50.1	−60 39.3
8	297 20.6	27.5	44	Sabik	103 01.8	−15 40.4
9	312 20.8	·· 26.5				
10	327 21.0	25.5	3	Schedar	350 30.1	+56 18.0
11	342 21.1	24.5	45	Shaula	97 20.2	−37 04.3
12	357 21.3	− 4 23.5	18	Sirius	259 11.4	−16 39.5
13	12 21.4	22.6	33	Spica	159 16.2	−10 56.2
14	27 21.6	21.6	23	Suhail	223 23.7	−43 15.6
15	42 21.7	·· 20.6				
16	57 21.9	19.6	49	Vega	81 08.2	+38 44.3
17	72 22.1	18.7	39	Zub'g'bi	137 52.8	−15 51.8
18	87 22.2	− 4 17.7				
19	102 22.4	16.7				
20	117 22.5	15.7				
21	132 22.7	·· 14.7				
22	147 22.9	13.8				
23	162 23.0	12.8				
24	177 23.2	− 4 11.8				
code	—	+ 10				

Lat.	Sunrise	Twlt. begins	Moonrise 7	8	9	10
N °	h m	h m	h m	h m	h m	h m
72	7 00	3 04	▬	7 33	6 51	6 27
70	6 55	3 25	7 25	6 44	6 26	6 13
68	6 50	3 42	6 20	6 13	6 06	6 01
66	6 46	3 55	5 45	5 49	5 51	5 52
64	6 43	4 05	5 19	5 31	5 38	5 43
62	6 40	4 14	4 59	5 16	5 27	5 36
60	6 38	4 21	4 43	5 03	5 18	5 30
58	6 36	4 26	4 29	4 52	5 10	5 25
56	6 34	4 31	4 17	4 42	5 03	5 20
54	6 32	4 36	4 06	4 34	4 56	5 16
52	6 30	4 40	3 57	4 26	4 50	5 12
50	6 29	4 43	3 49	4 19	4 45	5 08
45	6 26	4 49	3 31	4 04	4 34	5 00
40	6 23	4 54	3 16	3 52	4 24	4 54
35	6 20	4 58	3 04	3 42	4 16	4 48
30	6 18	5 00	2 53	3 32	4 09	4 43
20	6 14	5 02	2 35	3 17	3 56	4 35
10	6 11	5 01	2 18	3 03	3 45	4 27
0	6 07	4 59	2 03	2 50	3 35	4 20
10	6 04	4 54	1 48	2 37	3 25	4 13
20	6 00	4 46	1 32	2 23	3 14	4 05
30	5 56	4 34	1 13	2 07	3 01	3 56
35	5 53	4 26	1 02	1 57	2 54	3 51
40	5 50	4 16	0 49	1 47	2 45	3 45
45	5 47	4 03	0 35	1 34	2 35	3 38
50	5 43	3 47	0 16	1 19	2 24	3 30
52	5 41	3 38	0 08	1 11	2 18	3 27
54	5 38	3 29	25 03	1 03	2 12	3 22
56	5 36	3 17	24 54	0 54	2 05	3 18
58	5 33	3 04	24 44	0 44	1 57	3 13
60	5 30	2 48	24 32	0 32	1 49	3 07
S						

Lat.	Sunset	Twlt. ends	Moonset 7	8	9	10
N °	h m	h m	h m	h m	h m	h m
72	17 24	21 27	▬	10 43	12 59	14 56
70	17 29	21 04	9 14	11 31	13 23	15 08
68	17 33	20 46	10 18	12 01	13 41	15 18
66	17 37	20 33	10 53	12 24	13 55	15 26
64	17 40	20 22	11 18	12 42	14 07	15 33
62	17 43	20 13	11 37	12 56	14 17	15 39
60	17 45	20 05	11 53	13 08	14 26	15 44
58	17 47	19 59	12 07	13 19	14 33	15 49
56	17 49	19 54	12 18	13 28	14 40	15 53
54	17 51	19 49	12 29	13 36	14 45	15 56
52	17 52	19 45	12 38	13 43	14 51	16 00
50	17 54	19 42	12 46	13 49	14 55	16 03
45	17 57	19 35	13 03	14 03	15 05	16 09
40	17 59	19 29	13 17	14 15	15 14	16 14
35	18 02	19 26	13 28	14 24	15 21	16 19
30	18 04	19 23	13 39	14 33	15 27	16 23
20	18 08	19 21	13 56	14 47	15 38	16 29
10	18 11	19 21	14 12	15 00	15 48	16 35
0	18 14	19 23	14 26	15 12	15 57	16 41
10	18 17	19 27	14 40	15 23	16 05	16 46
20	18 21	19 35	14 55	15 36	16 15	16 52
30	18 25	19 46	15 12	15 50	16 25	16 59
35	18 28	19 54	15 22	15 58	16 31	17 03
40	18 31	20 04	15 34	16 07	16 38	17 07
45	18 34	20 16	15 47	16 18	16 46	17 12
50	18 38	20 32	16 03	16 31	16 56	17 18
52	18 40	20 40	16 11	16 37	17 00	17 20
54	18 42	20 49	16 19	16 44	17 05	17 23
56	18 44	21 00	16 29	16 51	17 10	17 26
58	18 47	21 13	16 39	17 00	17 16	17 30
60	18 50	21 28	16 52	17 09	17 23	17 34
S						

GMT	Equation of Time (App. Mean) 7	8	9
h	m s	m s	m s
0	−11 12.1	−10 57.6	−10 42.8
6	−11 08.5	−10 53.9	−10 39.0
12	−11 04.9	−10 50.2	−10 35.2
18	−11 01.3	−10 46.5	−10 31.4
24	−10 57.6	−10 42.8	−10 27.6

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
7	8 14	14 48	7 21	22 44	5 05
8	9 01	14 48	7 20	22 40	5 01
9	9 46	14 49	7 19	22 35	4 57
10	10 30	14 49	7 18	22 31	4 53

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.4	0.1	0.1
30	0.4	0.1	0.1
45	0.4	0.1	0.1
60	0.4	0.1	0.0
75	0.4	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	7	8	9
°	′	′	′
0	12.1	12.4	12.8
4	12.1	12.4	12.8
8	12.2	12.4	12.8
12	12.2	12.4	12.8
16	12.2	12.4	12.8
20	12.3	12.5	12.9
24	12.4	12.6	12.9
28	12.4	12.6	13.0
32	12.5	12.7	13.0
36	12.6	12.8	13.1
40	12.7	12.9	13.2
44	12.8	13.0	13.3
48	12.9	13.1	13.4
52	13.1	13.3	13.5
56	13.2	13.4	13.7
60	13.4	13.5	13.8
64	13.5	13.7	13.9
68	13.7	13.9	14.1
72	13.9	14.0	14.2
76	14.1	14.2	14.3
80	14.3	14.4	14.5
84	14.4	14.5	14.6
88	14.6	14.7	14.8
90	14.8	14.8	14.9

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	7	8	9
°	′	′	′
0	17.5	17.4	17.2
4	17.5	17.4	17.1
8	17.5	17.3	17.1
12	17.4	17.3	17.1
16	17.4	17.2	17.0
20	17.3	17.2	17.0
24	17.2	17.1	16.9
28	17.2	17.0	16.9
32	17.1	16.9	16.8
36	16.9	16.8	16.7
40	16.8	16.7	16.6
44	16.7	16.6	16.5
48	16.6	16.5	16.4
52	16.4	16.3	16.2
56	16.2	16.2	16.1
60	16.1	16.0	16.0
64	15.9	15.9	15.8
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.3
84	15.0	15.0	15.1
88	14.9	14.9	15.0
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.7 GHA	VENUS −3.7 Dec	MARS 1.0 GHA	MARS 1.0 Dec	JUPITER −2.0 GHA	JUPITER −2.0 Dec	SATURN 0.6 GHA	SATURN 0.6 Dec	MOON GHA	MOON code	MOON Dec	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
10 00	167 38.6	137 50.1	+13 22.2	250 22.4	−23 34.5	21 12.6	+14 43.7	286 27.1	−18 38.0	207 08.3	141	−10 33.4	+105
01	182 41.0	152 49.9	23.3	265 23.1	34.4	36 15.3	43.8	301 29.5	38.0	221 41.4	141	10 22.9	+105
02	197 43.5	167 49.7	24.5	280 23.8	34.4	51 18.1	43.9	316 32.0	38.0	236 14.5	142	10 12.4	+106
03	212 46.0	182 49.5	·· 25.6	295 24.5	·· 34.4	66 20.8	·· 44.0	331 34.4	·· 38.0	250 47.7	141	·10 01.8	+106
04	227 48.4	197 49.2	26.8	310 25.1	34.3	81 23.5	44.1	346 36.9	38.0	265 20.8	141	9 51.2	+106
05	242 50.9	212 49.0	27.9	325 25.8	34.3	96 26.2	44.2	1 39.3	38.0	279 53.9	142	9 40.6	+107
06	257 53.4	227 48.8	+13 29.1	340 26.5	−23 34.2	111 29.0	+14 44.3	16 41.8	−18 38.0	294 27.1	142	− 9 29.9	+108
07	272 55.8	242 48.6	30.2	355 27.2	34.2	126 31.7	44.3	31 44.2	38.0	309 00.3	141	9 19.1	+108
08	287 58.3	257 48.4	31.4	10 27.8	34.2	141 34.4	44.4	46 46.7	38.0	323 33.4	142	9 08.3	+108
09	303 00.8	272 48.2	·· 32.5	25 28.5	·· 34.1	156 37.1	·· 44.5	61 49.2	·· 38.0	338 06.6	142	· 8 57.5	+109
10	318 03.2	287 48.0	33.7	40 29.2	34.1	171 39.9	44.6	76 51.6	38.0	352 39.8	142	8 46.6	+110
11	333 05.7	302 47.7	34.8	55 29.9	34.1	186 42.6	44.7	91 54.1	37.9	7 13.0	142	8 35.6	+110
12	348 08.1	317 47.5	+13 35.9	70 30.6	−23 34.0	201 45.3	+14 44.8	106 56.5	−18 37.9	21 46.2	142	− 8 24.6	+110
13	3 10.6	332 47.3	37.1	85 31.2	34.0	216 48.1	44.9	121 59.0	37.9	36 19.4	142	8 13.6	+111
14	18 13.1	347 47.1	38.2	100 31.9	33.9	231 50.8	45.0	137 01.4	37.9	50 52.6	142	· 8 02.5	+111
15	33 15.5	2 46.9	·· 39.4	115 32.6	·· 33.9	246 53.5	·· 45.1	152 03.9	·· 37.9	65 25.8	142	· 7 51.4	+112
16	48 18.0	17 46.7	40.5	130 33.3	33.9	261 56.2	45.1	167 06.3	37.9	79 59.0	143	7 40.2	+112
17	63 20.5	32 46.4	41.7	145 34.0	33.8	276 59.0	45.2	182 08.8	37.9	94 32.3	142	7 29.0	+112
18	78 22.9	47 46.2	+13 42.8	160 34.6	−23 33.8	292 01.7	+14 45.3	197 11.2	−18 37.9	109 05.5	142	− 7 17.8	+113
19	93 25.4	62 46.0	43.9	175 35.3	33.7	307 04.4	45.4	212 13.7	37.9	123 38.7	142	7 06.5	+113
20	108 27.9	77 45.8	45.1	190 36.0	33.7	322 07.1	45.5	227 16.2	37.9	138 11.9	142	6 55.2	+114
21	123 30.3	92 45.6	·· 46.2	205 36.7	·· 33.6	337 09.9	·· 45.6	242 18.6	·· 37.9	152 45.1	143	· 6 43.8	+114
22	138 32.8	107 45.4	47.4	220 37.4	33.6	352 12.6	45.7	257 21.1	37.9	167 18.4	142	6 32.4	+114
23	153 35.2	122 45.1	48.5	235 38.0	33.6	7 15.3	45.8	272 23.5	37.9	181 51.6	142	6 21.0	+115
11 00	168 37.7	137 44.9	+13 49.6	250 38.7	−23 33.5	22 18.0	+14 45.8	287 26.0	−18 37.9	196 24.8	142	− 6 09.5	+115
01	183 40.2	152 44.7	50.8	265 39.4	33.5	37 20.8	45.9	302 28.5	37.9	210 58.0	142	5 58.0	+115
02	198 42.6	167 44.5	51.9	280 40.1	33.4	52 23.5	46.0	317 30.9	37.9	225 31.2	142	5 46.5	+116
03	213 45.1	182 44.3	·· 53.1	295 40.8	·· 33.4	67 26.2	·· 46.1	332 33.4	·· 37.9	240 04.4	142	· 5 34.9	+116
04	228 47.6	197 44.1	54.2	310 41.4	33.3	82 28.9	46.2	347 35.8	37.8	254 37.6	142	5 23.3	+116
05	243 50.0	212 43.8	55.3	325 42.1	33.3	97 31.6	46.3	2 38.3	37.8	269 10.8	142	5 11.7	+117
06	258 52.5	227 43.6	+13 56.5	340 42.8	−23 33.2	112 34.4	+14 46.4	17 40.7	−18 37.8	283 44.0	142	− 5 00.0	+117
07	273 55.0	242 43.4	57.6	355 43.5	33.2	127 37.1	46.4	32 43.2	37.8	298 17.2	142	4 48.3	+117
08	288 57.4	257 43.2	58.7	10 44.2	33.2	142 39.8	46.5	47 45.7	37.8	312 50.4	141	4 36.6	+118
09	303 59.9	272 43.0	·13 59.9	25 44.8	·· 33.1	157 42.5	·· 46.6	62 48.1	·· 37.8	327 23.5	142	· 4 24.8	+118
10	319 02.4	287 42.8	14 01.0	40 45.5	33.1	172 45.3	46.7	77 50.6	37.8	341 56.7	142	4 13.0	+118
11	334 04.8	302 42.5	02.1	55 46.2	33.0	187 48.0	46.8	92 53.0	37.8	356 29.9	141	4 01.2	+119
12	349 07.3	317 42.3	+14 03.3	70 46.9	−23 33.0	202 50.7	+14 46.9	107 55.5	−18 37.8	11 03.0	141	− 3 49.3	+118
13	4 09.7	332 42.1	04.4	85 47.6	32.9	217 53.4	47.0	122 58.0	37.8	25 36.1	142	3 37.5	+119
14	19 12.2	347 41.9	05.5	100 48.2	32.9	232 56.1	47.1	138 00.4	37.8	40 09.3	141	3 25.6	+119
15	34 14.7	2 41.7	·· 06.7	115 48.9	·· 32.8	247 58.9	·· 47.1	153 02.9	·· 37.8	54 42.4	141	· 3 13.7	+120
16	49 17.1	17 41.4	07.8	130 49.6	32.8	263 01.6	47.2	168 05.3	37.8	69 15.5	140	3 01.7	+119
17	64 19.6	32 41.2	08.9	145 50.3	32.7	278 04.3	47.3	183 07.8	37.8	83 48.5	141	2 49.8	+120
18	79 22.1	47 41.0	+14 10.0	160 51.0	−23 32.7	293 07.0	+14 47.4	198 10.3	−18 37.8	98 21.6	141	− 2 37.8	+120
19	94 24.5	62 40.8	11.2	175 51.6	32.6	308 09.7	47.5	213 12.7	37.8	112 54.7	140	2 25.8	+121
20	109 27.0	77 40.6	12.3	190 52.3	32.6	323 12.5	47.6	228 15.2	37.7	127 27.7	140	2 13.7	+120
21	124 29.5	92 40.3	·· 13.4	205 53.0	·· 32.5	338 15.2	·· 47.6	243 17.6	·· 37.7	142 00.7	140	· 2 01.7	+121
22	139 31.9	107 40.1	14.6	220 53.7	32.5	353 17.9	47.7	258 20.1	37.7	156 33.7	140	1 49.6	+121
23	154 34.4	122 39.9	15.7	235 54.4	32.4	8 20.6	47.8	273 22.6	37.7	171 06.7	140	1 37.5	+120
12 00	169 36.9	137 39.7	+14 16.8	250 55.0	−23 32.4	23 23.3	+14 47.9	288 25.0	−18 37.7	185 39.7	140	− 1 25.5	+122
01	184 39.3	152 39.5	17.9	265 55.7	32.3	38 26.1	48.0	303 27.5	37.7	200 12.7	139	1 13.3	+121
02	199 41.8	167 39.2	19.1	280 56.4	32.3	53 28.8	48.1	318 30.0	37.7	214 45.6	139	1 01.2	+121
03	214 44.2	182 39.0	·· 20.2	295 57.1	·· 32.2	68 31.5	·· 48.2	333 32.4	·· 37.7	229 18.5	139	· 0 49.1	+122
04	229 46.7	197 38.8	21.3	310 57.8	32.2	83 34.2	48.2	348 34.9	37.7	243 51.4	139	0 36.9	+122
05	244 49.2	212 38.6	22.4	325 58.4	32.1	98 36.9	48.3	3 37.3	37.7	258 24.3	138	0 24.7	+121
06	259 51.6	227 38.4	+14 23.5	340 59.1	−23 32.1	113 39.6	+14 48.4	18 39.8	−18 37.7	272 57.1	138	− 0 12.6	+122
07	274 54.1	242 38.1	24.7	355 59.8	32.0	128 42.4	48.5	33 42.3	37.7	287 29.9	138	− 0 00.4	+122
08	289 56.6	257 37.9	25.8	11 00.5	31.9	143 45.1	48.6	48 44.7	37.7	302 02.7	138	+ 0 11.8	+122
09	304 59.0	272 37.7	·· 26.9	26 01.2	·· 31.9	158 47.8	·· 48.7	63 47.2	·· 37.7	316 35.5	138	· 0 24.0	+122
10	320 01.5	287 37.5	28.0	41 01.8	31.8	173 50.5	48.7	78 49.7	37.7	331 08.3	137	0 36.2	+123
11	335 04.0	302 37.3	29.1	56 02.5	31.8	188 53.2	48.8	93 52.1	37.6	345 41.0	137	0 48.5	+122
12	350 06.4	317 37.0	+14 30.3	71 03.2	−23 31.7	203 55.9	+14 48.9	108 54.6	−18 37.6	0 13.7	136	+ 1 00.7	+122
13	5 08.9	332 36.8	31.4	86 03.9	31.7	218 58.7	49.0	123 57.0	37.6	14 46.3	137	1 12.9	+123
14	20 11.3	347 36.6	32.5	101 04.6	31.6	234 01.4	49.1	138 59.5	37.6	29 19.0	136	1 25.2	+122
15	35 13.8	2 36.4	·· 33.6	116 05.3	·· 31.6	249 04.1	·· 49.2	154 02.0	·· 37.6	43 51.6	136	· 1 37.4	+122
16	50 16.3	17 36.2	34.7	131 05.9	31.5	264 06.8	49.3	169 04.4	37.6	58 24.2	135	1 49.6	+123
17	65 18.7	32 35.9	35.9	146 06.6	31.5	279 09.5	49.3	184 06.9	37.6	72 56.7	136	2 01.9	+122
18	80 21.2	47 35.7	+14 37.0	161 07.3	−23 31.4	294 12.2	+14 49.4	199 09.4	−18 37.6	87 29.3	134	+ 2 14.1	+123
19	95 23.7	62 35.5	38.1	176 08.0	31.3	309 15.0	49.5	214 11.8	37.6	102 01.7	135	2 26.4	+122
20	110 26.1	77 35.3	39.2	191 08.7	31.3	324 17.7	49.6	229 14.3	37.6	116 34.2	134	2 38.6	+122
21	125 28.6	92 35.0	·· 40.3	206 09.3	·· 31.2	339 20.4	·· 49.7	244 16.8	·· 37.6	131 06.6	134	· 2 50.8	+123
22	140 31.1	107 34.8	41.4	221 10.0	31.2	354 23.1	49.8	259 19.2	37.6	145 39.0	134	3 03.1	+122
23	155 33.5	122 34.6	42.5	236 10.7	31.1	9 25.8	49.8	274 21.7	37.6	160 11.4	133	3 15.3	+122
24	170 36.0	137 34.4	+14 43.7	251 11.4	−23 31.0	24 28.5	+14 49.9	289 24.2	−18 37.6	174 43.7	133	+ 3 27.5	+122
code	−	− 2	+ 11	+ 7	+ 1	+ 27	+ 1	+ 25	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
10 00	177 23.2	− 4 11.8
01	192 23.3	10.8
02	207 23.5	09.8
03	222 23.7	08.9
04	237 23.8	07.9
05	252 24.0	06.9
06	267 24.1	− 4 05.9
07	282 24.3	04.9
08	297 24.5	04.0
09	312 24.6	03.0
10	327 24.8	02.0
11	342 24.9	01.0
12	357 25.1	− 4 00.0
13	12 25.3	3 59.1
14	27 25.4	58.1
15	42 25.6	57.1
16	57 25.8	56.1
17	72 25.9	55.1
18	87 26.1	− 3 54.2
19	102 26.2	53.2
20	117 26.4	52.2
21	132 26.6	51.2
22	147 26.7	50.2
23	162 26.9	49.2
11 00	177 27.1	− 3 48.3
01	192 27.2	47.3
02	207 27.4	46.3
03	222 27.6	45.3
04	237 27.7	44.3
05	252 27.9	43.4
06	267 28.0	− 3 42.4
07	282 28.2	41.4
08	297 28.4	40.4
09	312 28.5	39.4
10	327 28.7	38.4
11	342 28.9	37.5
12	357 29.0	− 3 36.5
13	12 29.2	35.5
14	27 29.4	34.5
15	42 29.5	33.5
16	57 29.7	32.5
17	72 29.9	31.6
18	87 30.0	− 3 30.6
19	102 30.2	29.6
20	117 30.4	28.6
21	132 30.5	27.6
22	147 30.7	26.7
23	162 30.9	25.7
12 00	177 31.0	− 3 24.7
01	192 31.2	23.7
02	207 31.4	22.7
03	222 31.5	21.7
04	237 31.7	20.7
05	252 31.9	19.8
06	267 32.0	− 3 18.8
07	282 32.2	17.8
08	297 32.4	16.8
09	312 32.5	15.8
10	327 32.7	14.8
11	342 32.9	13.9
12	357 33.0	− 3 12.9
13	12 33.2	11.9
14	27 33.4	10.9
15	42 33.5	09.9
16	57 33.7	08.9
17	72 33.9	08.0
18	87 34.0	− 3 07.0
19	102 34.2	06.0
20	117 34.4	05.0
21	132 34.5	04.0
22	147 34.7	03.0
23	162 34.9	02.0
24	177 35.1	− 3 01.1
code	−	+ 10

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.1	−40 29.0
5	Achernar	335 59.1	−57 27.7
30	Acrux	173 56.7	−62 51.5
19	Adhara	255 46.1	−28 55.0
10	Aldebaran	291 38.7	+16 25.3
32	Alioth	166 57.7	+56 11.6
34	Alkaid	153 32.2	+49 31.6
55	Al Na'ir	28 37.9	−47 10.3
15	Alnilam	276 29.9	− 1 13.9
25	Alphard	218 38.0	− 8 28.3
41	Alphecca	126 47.2	+26 51.4
1	Alpheratz	358 28.3	+28 50.9
51	Altair	62 50.3	+ 8 45.0
2	Ankaa	353 58.3	−42 32.7
42	Antares	113 18.8	−26 20.2
37	Arcturus	146 34.6	+19 24.3
43	Atria	108 59.2	−68 56.8
22	Avior	234 35.2	−59 22.4
13	Bellatrix	279 18.0	+ 6 18.6
16	Betelg'se	271 47.7	+ 7 23.9
17	Canopus	264 15.1	−52 40.6
12	Capella	281 37.9	+45 57.5
53	Deneb	50 01.1	+45 07.2
28	Denebola	183 17.0	+14 48.8
4	Diphda	349 39.2	−18 13.7
27	Dubhe	194 43.5	+61 59.1
14	Elnath	279 06.9	+28 34.4
47	Eltanin	91 06.1	+51 29.3
54	Enif	34 29.5	+ 9 40.4
56	Fomalhaut	16 11.6	−29 51.3
31	Gacrux	172 48.3	−56 52.2
29	Gienah	176 36.2	−17 18.1
35	Hadar	149 48.4	−60 09.7
6	Hamal	328 49.5	+23 15.4
48	Kaus Aust.	84 40.8	−34 24.3
40	Kochab	137 17.2	+74 19.7
57	Markab	14 21.4	+14 58.1
8	Menkar	315 00.1	+ 3 55.1
36	Menkent	148 57.9	−36 09.4
24	Miapl'dus	221 48.2	−69 32.5
9	Mirfak	309 42.1	+49 42.6
50	Nunki	76 51.6	−26 21.1
52	Peacock	54 27.1	−56 52.4
21	Pollux	244 19.9	+28 07.9
20	Procyon	245 44.4	+ 5 20.1
46	R'alhague	96 46.3	+12 35.3
26	Regulus	208 28.8	+12 10.7
11	Rigel	281 53.3	− 8 15.2
38	Rigil Kent.	140 50.0	−60 39.3
44	Sabik	103 01.7	−15 40.4
3	Schedar	350 30.1	+56 18.0
45	Shaula	97 20.2	−37 04.3
18	Sirius	259 11.4	−16 39.5
33	Spica	159 16.2	−10 56.2
23	Suhail	223 23.7	−43 15.6
49	Vega	81 08.1	+38 44.3
39	Zub'g'bi	137 52.8	−15 51.8

GMT	Equation of Time (App. − Mean) 10	11	12
h	m s	m s	m s
0	−10 27.6	−10 12.1	− 9 56.3
6	−10 23.8	−10 08.2	− 9 52.3
12	−10 19.9	−10 04.2	− 9 48.2
18	−10 16.0	−10 00.3	− 9 44.2
24	−10 12.1	− 9 56.3	− 9 40.1

Lat.	Sunrise	Twlt. begins	Moonrise 10	11	12	13
N °	h m	h m	h m	h m	h m	h m
72	6 45	2 41	6 27	6 09	5 52	5 36
70	6 41	3 07	6 13	6 02	5 52	5 42
68	6 38	3 27	6 01	5 56	5 52	5 47
66	6 35	3 42	5 52	5 51	5 51	5 51
64	6 33	3 53	5 43	5 47	5 51	5 55
62	6 31	4 03	5 36	5 44	5 51	5 58
60	6 29	4 11	5 30	5 41	5 51	6 01
58	6 27	4 17	5 25	5 38	5 50	6 03
56	6 26	4 23	5 20	5 35	5 50	6 05
54	6 25	4 28	5 16	5 33	5 50	6 07
52	6 24	4 33	5 12	5 31	5 50	6 09
50	6 22	4 37	5 08	5 29	5 50	6 11
45	6 20	4 44	5 00	5 25	5 50	6 14
40	6 18	4 50	4 54	5 22	5 49	6 17
35	6 16	4 54	4 48	5 19	5 49	6 20
30	6 15	4 57	4 43	5 16	5 49	6 23
20	6 12	5 00	4 35	5 12	5 49	6 27
10	6 09	5 00	4 27	5 08	5 48	6 30
0	6 07	4 58	4 20	5 04	5 48	6 34
10	6 04	4 54	4 13	5 00	5 48	6 37
20	6 01	4 47	4 05	4 56	5 48	6 41
30	5 58	4 36	3 56	4 52	5 48	6 45
35	5 56	4 29	3 51	4 49	5 48	6 48
40	5 53	4 20	3 45	4 46	5 48	6 51
45	5 51	4 08	3 38	4 42	5 47	6 54
50	5 47	3 53	3 30	4 38	5 47	6 58
52	5 46	3 45	3 27	4 36	5 47	7 00
54	5 44	3 36	3 22	4 34	5 47	7 02
56	5 42	3 26	3 18	4 32	5 47	7 04
58	5 40	3 14	3 13	4 29	5 47	7 07
60 S	5 38	2 59	3 07	4 26	5 47	7 10

Lat.	Sunset	Twlt. ends	Moonset 10	11	12	13
N °	h m	h m	h m	h m	h m	h m
72	17 38	21 49	14 56	16 48	18 39	20 35
70	17 41	21 21	15 08	16 52	18 36	20 23
68	17 44	21 00	15 18	16 55	18 33	20 14
66	17 47	20 45	15 26	16 58	18 31	20 07
64	17 49	20 33	15 33	17 01	18 29	20 00
62	17 51	20 23	15 39	17 03	18 27	19 54
60	17 52	20 13	15 44	17 05	18 26	19 50
58	17 54	20 07	15 49	17 06	18 25	19 45
56	17 55	20 00	15 53	17 08	18 24	19 42
54	17 56	19 55	15 56	17 09	18 23	19 38
52	17 58	19 51	16 00	17 10	18 22	19 35
50	17 59	19 47	16 03	17 11	18 21	19 33
45	18 01	19 39	16 09	17 13	18 19	19 27
40	18 03	19 33	16 14	17 15	18 18	19 22
35	18 04	19 28	16 19	17 17	18 16	19 17
30	18 06	19 26	16 23	17 18	18 15	19 14
20	18 08	19 21	16 29	17 21	18 13	19 07
10	18 11	19 21	16 35	17 23	18 12	19 01
0	18 13	19 22	16 41	17 25	18 10	18 56
10	18 16	19 26	16 46	17 27	18 08	18 51
20	18 19	19 33	16 52	17 29	18 06	18 45
30	18 22	19 42	16 59	17 31	18 04	18 39
35	18 24	19 50	17 03	17 33	18 03	18 35
40	18 26	19 58	17 07	17 34	18 02	18 31
45	18 29	20 10	17 12	17 36	18 00	18 26
50	18 32	20 25	17 18	17 38	17 59	18 20
52	18 33	20 31	17 20	17 39	17 58	18 18
54	18 35	20 40	17 23	17 40	17 57	18 15
56	18 37	20 50	17 26	17 41	17 56	18 11
58	18 39	21 02	17 30	17 42	17 55	18 08
60 S	18 41	21 15	17 34	17 44	17 53	18 04

DAY	GMT of Transit Meridian of Greenwich Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
10	10 30	14 49	7 18	22 31	4 53
11	11 14	14 49	7 17	22 27	4 50
12	11 59	14 50	7 16	22 22	4 46
13	12 45	14 50	7 15	22 18	4 42

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.4	0.1	0.1
30	0.4	0.1	0.1
45	0.4	0.1	0.1
60	0.4	0.1	0.0
75	0.4	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	10	11	12
°	′	′	′
0	13.3	13.9	14.7
4	13.3	13.9	14.7
8	13.3	13.9	14.7
12	13.3	13.9	14.7
16	13.3	14.0	14.7
20	13.4	14.0	14.7
24	13.4	14.0	14.7
28	13.5	14.1	14.8
32	13.6	14.1	14.8
36	13.6	14.2	14.8
40	13.7	14.2	14.8
44	13.8	14.3	14.9
48	13.9	14.4	14.9
52	14.0	14.4	14.9
56	14.1	14.5	15.0
60	14.2	14.6	15.0
64	14.3	14.7	15.1
68	14.4	14.8	15.1
72	14.6	14.8	15.2
76	14.7	14.9	15.2
80	14.8	15.0	15.3
84	14.9	15.1	15.3
88	15.0	15.2	15.3
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	10	11	12
°	′	′	′
0	16.9	16.5	16.1
4	16.8	16.5	16.1
8	16.8	16.5	16.0
12	16.8	16.5	16.0
16	16.8	16.4	16.0
20	16.7	16.4	16.0
24	16.7	16.4	16.0
28	16.6	16.3	16.0
32	16.6	16.3	15.9
36	16.5	16.2	15.9
40	16.4	16.2	15.9
44	16.3	16.1	15.8
48	16.2	16.0	15.8
52	16.1	16.0	15.8
56	16.0	15.9	15.7
60	15.9	15.8	15.7
64	15.8	15.7	15.6
68	15.7	15.6	15.6
72	15.6	15.6	15.6
76	15.4	15.5	15.5
80	15.3	15.4	15.5
84	15.2	15.3	15.4
88	15.1	15.2	15.4
90			

Subtract from table, back cover

New Moon 12

292626 O - 55 - 4

GMT	♈ GHA	VENUS −3.7 GHA	VENUS −3.7 Dec.	MARS 1.0 GHA	MARS 1.0 Dec.	JUPITER −2.0 GHA	JUPITER −2.0 Dec.	SATURN 0.6 GHA	SATURN 0.6 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
13 00	170 36.0	137 34.4	+14 43.7	251 11.4	−23 31.0	24 28.5	+14 49.9	289 24.2	−18 37.6	174 43.7	133	+ 3 27.5	+122
01	185 38.5	152 34.2	44.8	266 12.1	31.0	39 31.2	50.0	304 26.6	37.5	189 16.0	132	3 39.7	+122
02	200 40.9	167 33.9	45.9	281 12.8	30.9	54 34.0	50.1	319 29.1	37.5	203 48.2	132	3 51.9	+122
03	215 43.4	182 33.7	47.0	296 13.4	30.9	69 36.7	50.2	334 31.6	37.5	218 20.4	132	· 4 04.1	+122
04	230 45.8	197 33.5	48.1	311 14.1	30.8	84 39.4	50.3	349 34.0	37.5	232 52.6	131	4 16.3	+122
05	245 48.3	212 33.3	49.2	326 14.8	30.8	99 42.1	50.3	4 36.5	37.5	247 24.7	131	4 28.5	+121
06	260 50.8	227 33.0	+14 50.3	341 15.5	−23 30.7	114 44.8	+14 50.4	19 39.0	−18 37.5	261 56.8	131	+ 4 40.6	+122
07	275 53.2	242 32.8	51.4	356 16.2	30.6	129 47.5	50.5	34 41.4	37.5	276 28.9	130	4 52.8	+121
08	290 55.7	257 32.6	52.5	11 16.8	30.6	144 50.2	50.6	49 43.9	37.5	291 00.9	129	5 04.9	+121
09	305 58.2	272 32.4	53.6	26 17.5	30.5	159 52.9	50.7	64 46.4	37.5	305 32.8	130	· 5 17.0	+121
10	321 00.6	287 32.1	54.7	41 18.2	30.4	174 55.7	50.7	79 48.8	37.5	320 04.8	128	5 29.1	+121
11	336 03.1	302 31.9	55.8	56 18.9	30.4	189 58.4	50.8	94 51.3	37.5	334 36.6	129	5 41.2	+121
12	351 05.6	317 31.7	+14 57.0	71 19.6	−23 30.3	205 01.1	+14 50.9	109 53.8	−18 37.5	349 08.5	128	+ 5 53.3	+120
13	6 08.0	332 31.5	58.1	86 20.3	30.3	220 03.8	51.0	124 56.2	37.5	3 40.3	127	6 05.3	+121
14	21 10.5	347 31.3	14 59.2	101 20.9	30.2	235 06.5	51.1	139 58.7	37.4	18 12.0	127	6 17.4	+120
15	36 13.0	2 31.0	·15 00.3	116 21.6	30.1	250 09.2	51.2	155 01.2	37.4	32 43.7	127	· 6 29.4	+120
16	51 15.4	17 30.8	01.4	131 22.3	30.1	265 11.9	51.2	170 03.7	37.4	47 15.4	126	6 41.4	+119
17	66 17.9	32 30.6	02.5	146 23.0	30.0	280 14.6	51.3	185 06.1	37.4	61 47.0	125	6 53.3	+120
18	81 20.3	47 30.4	+15 03.6	161 23.7	−23 29.9	295 17.3	+14 51.4	200 08.6	−18 37.4	76 18.5	125	+ 7 05.3	+119
19	96 22.8	62 30.1	04.7	176 24.4	29.9	310 20.0	51.5	215 11.1	37.4	90 50.0	125	7 17.2	+118
20	111 25.3	77 29.9	05.8	191 25.0	29.8	325 22.8	51.6	230 13.5	37.4	105 21.5	124	7 29.0	+119
21	126 27.7	92 29.7	06.9	206 25.7	29.7	340 25.5	51.6	245 16.0	37.4	119 52.9	124	· 7 40.9	+118
22	141 30.2	107 29.5	08.0	221 26.4	29.7	355 28.2	51.7	260 18.5	37.4	134 24.3	123	7 52.7	+118
23	156 32.7	122 29.2	09.1	236 27.1	29.6	10 30.9	51.8	275 20.9	37.4	148 55.6	122	8 04.5	+118
14 00	171 35.1	137 29.0	+15 10.2	251 27.8	−23 29.5	25 33.6	+14 51.9	290 23.4	−18 37.4	163 26.8	122	+ 8 16.3	+117
01	186 37.6	152 28.8	11.3	266 28.5	29.5	40 36.3	52.0	305 25.9	37.4	177 58.0	122	8 28.0	+117
02	201 40.1	167 28.6	12.4	281 29.1	29.4	55 39.0	52.0	320 28.4	37.3	192 29.2	121	8 39.7	+117
03	216 42.5	182 28.3	13.5	296 29.8	29.3	70 41.7	52.1	335 30.8	37.3	207 00.3	120	· 8 51.4	+116
04	231 45.0	197 28.1	14.6	311 30.5	29.3	85 44.4	52.2	350 33.3	37.3	221 31.3	120	9 03.0	+116
05	246 47.4	212 27.9	15.7	326 31.2	29.2	100 47.1	52.3	5 35.8	37.3	236 02.3	119	9 14.6	+115
06	261 49.9	227 27.7	+15 16.8	341 31.9	−23 29.1	115 49.8	+14 52.4	20 38.2	−18 37.3	250 33.2	119	+ 9 26.1	+115
07	276 52.4	242 27.4	17.8	356 32.6	29.1	130 52.5	52.4	35 40.7	37.3	265 04.1	118	9 37.6	+115
08	291 54.8	257 27.2	18.9	11 33.2	29.0	145 55.2	52.5	50 43.2	37.3	279 34.9	117	9 49.1	+114
09	306 57.3	272 27.0	20.0	26 33.9	28.9	160 58.0	52.6	65 45.7	37.3	294 05.6	117	·10 00.5	+114
10	321 59.8	287 26.7	21.1	41 34.6	28.9	176 00.7	52.7	80 48.1	37.3	308 36.3	117	10 11.9	+114
11	337 02.2	302 26.5	22.2	56 35.3	28.8	191 03.4	52.8	95 50.6	37.3	323 07.0	116	10 23.3	+113
12	352 04.7	317 26.3	+15 23.3	71 36.0	−23 28.7	206 06.1	+14 52.8	110 53.1	−18 37.3	337 37.6	115	+10 34.6	+112
13	7 07.2	332 26.1	24.4	86 36.7	28.7	221 08.8	52.9	125 55.5	37.3	352 08.1	114	10 45.8	+112
14	22 09.6	347 25.8	25.5	101 37.3	28.6	236 11.5	53.0	140 58.0	37.2	6 38.5	114	10 57.0	+112
15	37 12.1	2 25.6	26.6	116 38.0	28.5	251 14.2	53.1	156 00.5	37.2	21 08.9	114	·11 08.2	+111
16	52 14.6	17 25.4	27.7	131 38.7	28.4	266 16.9	53.2	171 03.0	37.2	35 39.3	112	11 19.3	+110
17	67 17.0	32 25.2	28.8	146 39.4	28.4	281 19.6	53.2	186 05.4	37.2	50 09.5	112	11 30.3	+110
18	82 19.5	47 24.9	+15 29.8	161 40.1	−23 28.3	296 22.3	+14 53.3	201 07.9	−18 37.2	64 39.7	112	+11 41.3	+109
19	97 21.9	62 24.7	30.9	176 40.8	28.2	311 25.0	53.4	216 10.4	37.2	79 09.9	111	11 52.2	+109
20	112 24.4	77 24.5	32.0	191 41.5	28.2	326 27.7	53.5	231 12.9	37.2	93 40.0	110	12 03.1	+109
21	127 26.9	92 24.3	33.1	206 42.1	28.1	341 30.4	53.6	246 15.3	37.2	108 10.0	109	·12 14.0	+107
22	142 29.3	107 24.0	34.2	221 42.8	28.0	356 33.1	53.6	261 17.8	37.2	122 39.9	109	12 24.7	+108
23	157 31.8	122 23.8	35.3	236 43.5	27.9	11 35.8	53.7	276 20.3	37.2	137 09.8	109	12 35.5	+106
15 00	172 34.3	137 23.6	+15 36.4	251 44.2	−23 27.9	26 38.5	+14 53.8	291 22.8	−18 37.2	151 39.7	107	+12 46.1	+106
01	187 36.7	152 23.3	37.4	266 44.9	27.8	41 41.2	53.9	306 25.2	37.1	166 09.4	107	12 56.7	+106
02	202 39.2	167 23.1	38.5	281 45.6	27.7	56 43.9	54.0	321 27.7	37.1	180 39.1	106	13 07.3	+104
03	217 41.7	182 22.9	39.6	296 46.2	27.6	71 46.6	54.0	336 30.2	37.1	195 08.7	106	·13 17.7	+104
04	232 44.1	197 22.7	40.7	311 46.9	27.6	86 49.3	54.1	351 32.7	37.1	209 38.3	105	13 28.1	+104
05	247 46.6	212 22.4	41.8	326 47.6	27.5	101 52.0	54.2	6 35.1	37.1	224 07.8	104	13 38.5	+102
06	262 49.0	227 22.2	+15 42.8	341 48.3	−23 27.4	116 54.7	+14 54.3	21 37.6	−18 37.1	238 37.2	104	+13 48.7	+103
07	277 51.5	242 22.0	43.9	356 49.0	27.3	131 57.4	54.3	36 40.1	37.1	253 06.6	103	13 59.0	+101
08	292 54.0	257 21.7	45.0	11 49.7	27.3	147 00.1	54.4	51 42.6	37.1	267 35.9	102	14 09.1	+101
09	307 56.4	272 21.5	46.1	26 50.4	27.2	162 02.8	54.5	66 45.0	37.1	282 05.1	101	·14 19.2	+100
10	322 58.9	287 21.3	47.2	41 51.0	27.1	177 05.5	54.6	81 47.5	37.1	296 34.2	101	14 29.2	+ 99
11	338 01.4	302 21.1	48.2	56 51.7	27.0	192 08.2	54.7	96 50.0	37.1	311 03.3	100	14 39.1	+ 98
12	353 03.8	317 20.8	+15 49.3	71 52.4	−23 27.0	207 10.9	+14 54.7	111 52.5	−18 37.0	325 32.3	100	+14 48.9	+ 98
13	8 06.3	332 20.6	50.4	86 53.1	26.9	222 13.6	54.8	126 55.0	37.0	340 01.3	98	14 58.7	+ 97
14	23 08.8	347 20.4	51.5	101 53.8	26.8	237 16.3	54.9	141 57.4	37.0	354 30.1	98	15 08.4	+ 96
15	38 11.2	2 20.1	52.5	116 54.5	26.7	252 19.0	55.0	156 59.9	37.0	8 58.9	98	·15 18.0	+ 95
16	53 13.7	17 19.9	53.6	131 55.2	26.7	267 21.7	55.0	172 02.4	37.0	23 27.7	96	15 27.5	+ 95
17	68 16.2	32 19.7	54.7	146 55.8	26.6	282 24.4	55.1	187 04.9	37.0	37 56.3	96	15 37.0	+ 94
18	83 18.6	47 19.5	+15 55.8	161 56.5	−23 26.5	297 27.1	+14 55.2	202 07.3	−18 37.0	52 24.9	95	+15 46.4	+ 93
19	98 21.1	62 19.2	56.8	176 57.2	26.4	312 29.8	55.3	217 09.8	37.0	66 53.4	95	15 55.7	+ 92
20	113 23.5	77 19.0	57.9	191 57.9	26.3	327 32.5	55.4	232 12.3	37.0	81 21.9	94	16 04.9	+ 91
21	128 26.0	92 18.8	·15 59.0	206 58.6	26.3	342 35.2	55.4	247 14.8	37.0	95 50.3	93	·16 14.0	+ 91
22	143 28.5	107 18.5	16 00.1	221 59.3	26.2	357 37.9	55.5	262 17.3	36.9	110 18.6	92	16 23.1	+ 89
23	158 30.9	122 18.3	01.1	237 00.0	26.1	12 40.6	55.6	277 19.7	36.9	124 46.8	92	16 32.0	+ 89
24	173 33.4	137 18.1	+16 02.2	252 00.6	−23 26.0	27 43.3	+14 55.7	292 22.2	−18 36.9	139 15.0	91	+16 40.9	+ 87
code	—	− 2	+ 11	+ 7	0	+ 27	+ 1	+ 24	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
13 0	177 35.1	− 3 01.1
1	192 35.2	3 00.1
2	207 35.4	2 59.1
3	222 35.6	58.1
4	237 35.7	57.1
5	252 35.9	56.1
6	267 36.1	− 2 55.2
7	282 36.2	54.2
8	297 36.4	53.2
9	312 36.6	52.2
10	327 36.8	51.2
11	342 36.9	50.2
12	357 37.1	− 2 49.2
13	12 37.3	48.3
14	27 37.4	47.3
15	42 37.6	46.3
16	57 37.8	45.3
17	72 38.0	44.3
18	87 38.1	− 2 43.3
19	102 38.3	42.3
20	117 38.5	41.4
21	132 38.6	40.4
22	147 38.8	39.4
23	162 39.0	38.4
14 0	177 39.2	− 2 37.4
1	192 39.3	36.4
2	207 39.5	35.4
3	222 39.7	34.5
4	237 39.8	33.5
5	252 40.0	32.5
6	267 40.2	− 2 31.5
7	282 40.4	30.5
8	297 40.5	29.5
9	312 40.7	28.5
10	327 40.9	27.5
11	342 41.1	26.6
12	357 41.2	− 2 25.6
13	12 41.4	24.6
14	27 41.6	23.6
15	42 41.8	22.6
16	57 41.9	21.6
17	72 42.1	20.6
18	87 42.3	− 2 19.7
19	102 42.5	18.7
20	117 42.6	17.7
21	132 42.8	16.7
22	147 43.0	15.7
23	162 43.1	14.7
15 0	177 43.3	− 2 13.7
1	192 43.5	12.7
2	207 43.7	11.8
3	222 43.9	10.8
4	237 44.0	09.8
5	252 44.2	08.8
6	267 44.4	− 2 07.8
7	282 44.6	06.8
8	297 44.7	05.8
9	312 44.9	04.8
10	327 45.1	03.9
11	342 45.3	02.9
12	357 45.4	− 2 01.9
13	12 45.6	2 00.9
14	27 45.8	1 59.9
15	42 46.0	58.9
16	57 46.1	57.9
17	72 46.3	56.9
18	87 46.5	− 1 56.0
19	102 46.7	55.0
20	117 46.8	54.0
21	132 47.0	53.0
22	147 47.2	52.0
23	162 47.4	51.0
24	177 47.6	− 1 50.0
code	−	+ 10

STARS No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 51.1	−40 29.0
5	Achernar	335 59.1	−57 27.6
30	Acrux	173 56.7	−62 51.5
19	Adhara	255 46.1	−28 55.0
10	Aldebaran	291 38.7	+16 25.3
32	Alioth	166 57.7	+56 11.6
34	Alkaid	153 32.2	+49 31.6
55	Al Na'ir	28 37.9	−47 10.3
15	Alnilam	276 29.9	− 1 13.9
25	Alphard	218 38.0	− 8 28.3
41	Alphecca	126 47.1	+26 51.4
1	Alpheratz	358 28.3	+28 50.9
51	Altair	62 50.2	+ 8 45.0
2	Ankaa	353 58.3	−42 32.7
42	Antares	113 18.8	−26 20.2
37	Arcturus	146 34.6	+19 24.3
43	Atria	108 59.1	−68 56.8
22	Avior	234 35.2	−59 22.4
13	Bellatrix	279 18.0	+ 6 18.6
16	Betelg'se	271 47.7	+ 7 23.9
17	Canopus	264 15.1	−52 40.6
12	Capella	281 37.9	+45 57.5
53	Deneb	50 01.1	+45 07.2
28	Denebola	183 17.0	+14 48.8
4	Diphda	349 39.2	−18 13.7
27	Dubhe	194 43.5	+61 59.1
14	Elnath	279 06.9	+28 34.4
47	Eltanin	91 06.1	+51 29.3
54	Enif	34 29.5	+ 9 40.4
56	Fomalhaut	16 11.6	−29 51.3
31	Gacrux	172 48.3	−56 52.2
29	Gienah	176 36.2	−17 18.2
35	Hadar	149 48.4	−60 09.7
6	Hamal	328 49.5	+23 15.4
48	Kaus Aust.	84 40.8	−34 24.3
40	Kochab	137 17.2	+74 19.8
57	Markab	14 21.4	+14 58.1
8	Menkar	315 00.1	+ 3 55.1
36	Menkent	148 57.9	−36 09.4
24	Miapl'dus	221 48.2	−69 32.5
9	Mirfak	309 42.1	+49 42.6
50	Nunki	76 51.6	−26 21.1
52	Peacock	54 27.1	−56 52.4
21	Pollux	244 19.9	+28 07.9
20	Procyon	245 44.5	+ 5 20.1
46	R'alhague	96 46.3	+12 35.3
26	Regulus	208 28.8	+12 10.7
11	Rigel	281 53.3	− 8 15.2
38	Rigil Kent.	140 50.0	−60 39.3
44	Sabik	103 01.7	−15 40.4
3	Schedar	350 30.1	+56 18.0
45	Shaula	97 20.2	−37 04.3
18	Sirius	259 11.4	−16 39.5
33	Spica	159 16.2	−10 56.2
23	Suhail	223 23.7	−43 15.6
49	Vega	81 08.1	+38 44.3
39	Zub'g'bi	137 52.7	−15 51.8

GMT	Equation of Time (App.−Mean) 13	14	15
h	m s	m s	m s
0	− 9 40.1	− 9 23.7	− 9 07.1
6	− 9 36.1	− 9 19.6	− 9 02.8
12	− 9 32.0	− 9 15.4	− 8 58.6
18	− 9 27.8	− 9 11.2	− 8 54.4
24	− 9 23.7	− 9 07.1	− 8 50.1

Lat. N°	Sunrise h m	Twlt. begins h m	Moonrise 13 h m	14 h m	15 h m	16 h m
72	6 29	2 15	5 36	4 53	4 06	
70	6 27	2 48	5 42	5 31	5 18	5 00
68	6 25	3 10	5 47	5 42	5 37	5 33
66	6 24	3 27	5 51	5 51	5 53	5 57
64	6 22	3 41	5 55	5 59	6 06	6 16
62	6 21	3 51	5 58	6 06	6 17	6 32
60	6 20	4 01	6 01	6 12	6 26	6 45
58	6 19	4 08	6 03	6 17	6 34	6 57
56	6 18	4 15	6 05	6 22	6 42	7 07
54	6 17	4 21	6 07	6 26	6 48	7 15
52	6 17	4 25	6 09	6 30	6 54	7 23
50	6 16	4 30	6 11	6 33	6 59	7 30
45	6 15	4 38	6 14	6 41	7 11	7 46
40	6 13	4 45	6 17	6 47	7 21	7 58
35	6 12	4 50	6 20	6 53	7 29	8 09
30	6 11	4 52	6 23	6 58	7 36	8 19
20	6 09	4 57	6 27	7 06	7 49	8 35
10	6 08	4 58	6 30	7 14	8 00	8 50
0	6 06	4 57	6 34	7 21	8 11	9 03
10	6 04	4 54	6 37	7 28	8 21	9 17
20	6 02	4 48	6 41	7 36	8 33	9 31
30	6 00	4 39	6 45	7 45	8 46	9 48
35	5 58	4 32	6 48	7 50	8 53	9 58
40	5 56	4 24	6 51	7 56	9 02	10 09
45	5 54	4 13	6 54	8 02	9 12	10 23
50	5 52	3 59	6 58	8 11	9 25	10 39
52	5 51	3 51	7 00	8 15	9 30	10 47
54	5 50	3 44	7 02	8 19	9 37	10 55
56	5 48	3 34	7 04	8 23	9 44	11 05
58	5 47	3 24	7 07	8 29	9 52	11 16
60	5 45	3 11	7 10	8 35	10 01	11 29
S						

Lat. N°	Sunset h m	Twlt. ends h m	Moonset 13 h m	14 h m	15 h m	16 h m
72	17 52	22 16	20 35	22 41	25 16	1 16
70	17 54	21 41	20 23	22 18	24 24	0 24
68	17 55	21 16	20 14	22 00	23 52	25 51
66	17 57	20 58	20 07	21 45	23 28	25 13
64	17 58	20 44	20 00	21 34	23 10	24 45
62	17 59	20 32	19 54	21 24	22 55	24 25
60	18 00	20 23	19 50	21 15	22 43	24 08
58	18 01	20 15	19 45	21 08	22 32	23 54
56	18 01	20 07	19 42	21 01	22 22	23 42
54	18 02	20 02	19 38	20 56	22 14	23 31
52	18 03	19 57	19 35	20 50	22 07	23 22
50	18 03	19 52	19 33	20 46	22 00	23 13
45	18 05	19 43	19 27	20 35	21 46	22 56
40	18 06	19 36	19 22	20 27	21 34	22 41
35	18 07	19 31	19 17	20 20	21 24	22 29
30	18 08	19 28	19 14	20 14	21 15	22 18
20	18 09	19 22	19 07	20 03	21 00	22 00
10	18 11	19 21	19 01	19 53	20 47	21 44
0	18 12	19 21	18 56	19 44	20 35	21 29
10	18 14	19 24	18 51	19 35	20 23	21 14
20	18 16	19 29	18 45	19 26	20 10	20 58
30	18 18	19 38	18 39	19 15	19 55	20 40
35	18 20	19 45	18 35	19 09	19 47	20 30
40	18 21	19 53	18 31	19 02	19 37	20 18
45	18 23	20 03	18 26	18 54	19 26	20 04
50	18 25	20 16	18 20	18 44	19 12	19 47
52	18 26	20 23	18 18	18 40	19 06	19 38
54	18 28	20 32	18 15	18 35	18 59	19 29
56	18 29	20 40	18 11	18 29	18 51	19 19
58	18 30	20 50	18 08	18 23	18 42	19 08
60	18 32	21 03	18 04	18 16	18 32	18 55

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
13	12 45	14 50	7 15	22 18	4 42
14	13 33	14 50	7 14	22 14	4 38
15	14 23	14 51	7 13	22 09	4 34
16	15 16	14 51	7 12	22 05	4 30

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.4	0.2	0.1
30	0.4	0.1	0.1
45	0.4	0.1	0.1
60	0.4	0.1	0.0
75	0.4	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt. °	13 ′	14 ′	15 ′
0	15.3	15.9	16.6
4	15.3	15.9	16.6
8	15.3	15.9	16.6
12	15.3	15.9	16.5
16	15.3	15.9	16.5
20	15.3	15.9	16.5
24	15.3	15.9	16.5
28	15.3	15.9	16.5
32	15.3	15.9	16.5
36	15.3	15.9	16.4
40	15.3	15.9	16.4
44	15.3	15.9	16.4
48	15.4	15.8	16.3
52	15.4	15.8	16.3
56	15.4	15.8	16.2
60	15.4	15.8	16.2
64	15.4	15.8	16.1
68	15.4	15.8	16.1
72	15.4	15.7	16.0
76	15.4	15.7	16.0
80	15.5	15.7	15.9
84	15.5	15.7	15.9
88	15.5	15.7	15.8
90	15.5	15.6	15.8

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt. °	13 ′	14 ′	15 ′
0	15.7	15.3	15.0
4	15.7	15.3	15.0
8	15.7	15.3	15.0
12	15.7	15.3	15.0
16	15.7	15.3	15.0
20	15.7	15.4	15.0
24	15.7	15.4	15.0
28	15.7	15.4	15.1
32	15.7	15.4	15.1
36	15.7	15.4	15.1
40	15.6	15.4	15.2
44	15.6	15.4	15.2
48	15.6	15.4	15.3
52	15.6	15.5	15.3
56	15.6	15.5	15.3
60	15.6	15.5	15.4
64	15.6	15.5	15.4
68	15.6	15.5	15.5
72	15.6	15.5	15.5
76	15.5	15.6	15.6
80	15.5	15.6	15.7
84	15.5	15.6	15.7
88	15.5	15.6	15.8
90	15.5	15.6	15.8

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.8 GHA	VENUS −3.8 Dec.	MARS 1.0 GHA	MARS 1.0 Dec.	JUPITER −2.0 GHA	JUPITER −2.0 Dec.	SATURN 0.6 GHA	SATURN 0.6 Dec	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
16 0	173 33.4	137 18.1	+16 02.2	252 00.6	−23 26.0	27 43.3	+14 55.7	292 22.2	−18 36.9	139 15.0	91	+16 40.9 +	87
1	188 35.9	152 17.8	03.3	267 01.3	25.9	42 46.0	55.7	307 24.7	36.9	153 43.1	90	16 49.6 +	87
2	203 38.3	167 17.6	04.3	282 02.0	25.9	57 48.7	55.8	322 27.2	36.9	168 11.1	90	16 58.3 +	86
3	218 40.8	182 17.4	·· 05.4	297 02.7	·· 25.8	72 51.4	·· 55.9	337 29.7	·· 36.9	182 39.1	88	·17 06.9 +	85
4	233 43.3	197 17.2	06.5	312 03.4	25.7	87 54.1	56.0	352 32.1	36.9	197 06.9	89	17 15.4 +	84
5	248 45.7	212 16.9	07.5	327 04.1	25.6	102 56.8	56.0	7 34.6	36.9	211 34.8	87	17 23.8 +	83
6	263 48.2	227 16.7	+16 08.6	342 04.8	−23 25.5	117 59.5	+14 56.1	22 37.1	−18 36.9	226 02.5	87	+17 32.1 +	82
7	278 50.7	242 16.5	09.7	357 05.5	25.4	133 02.2	56.2	37 39.6	36.9	240 30.2	86	17 40.3 +	81
8	293 53.1	257 16.2	10.7	12 06.1	25.4	148 04.9	56.3	52 42.1	36.8	254 57.8	85	17 48.4 +	80
9	308 55.6	272 16.0	·· 11.8	27 06.8	·· 25.3	163 07.6	·· 56.3	67 44.5	·· 36.8	269 25.3	85	·17 56.4 +	79
10	323 58.0	287 15.8	12.9	42 07.5	25.2	178 10.3	56.4	82 47.0	36.8	283 52.8	84	18 04.3 +	78
11	339 00.5	302 15.5	13.9	57 08.2	25.1	193 13.0	56.5	97 49.5	36.8	298 20.2	83	18 12.1 +	78
12	354 03.0	317 15.3	+16 15.0	72 08.9	−23 25.0	208 15.7	+14 56.6	112 52.0	−18 36.8	312 47.5	82	+18 19.9 +	76
13	9 05.4	332 15.1	16.0	87 09.6	24.9	223 18.4	56.6	127 54.5	36.8	327 14.7	82	18 27.5 +	75
14	24 07.9	347 14.8	17.1	102 10.3	24.9	238 21.1	56.7	142 57.0	36.8	341 41.9	81	18 35.0 +	73
15	39 10.4	2 14.6	·· 18.2	117 10.9	·· 24.8	253 23.7	·· 56.8	157 59.4	·· 36.8	356 09.0	81	·18 42.3 +	73
16	54 12.8	17 14.4	19.2	132 11.6	24.7	268 26.4	56.9	173 01.9	36.8	10 36.1	80	18 49.6 +	72
17	69 15.3	32 14.1	20.3	147 12.3	24.6	283 29.1	56.9	188 04.4	36.8	25 03.1	79	18 56.8 +	71
18	84 17.8	47 13.9	+16 21.3	162 13.0	−23 24.5	298 31.8	+14 57.0	203 06.9	−18 36.7	39 30.0	78	+19 03.9 +	69
19	99 20.2	62 13.7	22.4	177 13.7	24.4	313 34.5	57.1	218 09.4	36.7	53 56.8	78	19 10.8 +	69
20	114 22.7	77 13.4	23.4	192 14.4	24.3	328 37.2	57.2	233 11.8	36.7	68 23.6	77	19 17.7 +	67
21	129 25.2	92 13.2	·· 24.5	207 15.1	·· 24.2	343 39.9	·· 57.2	248 14.3	·· 36.7	82 50.3	77	·19 24.4 +	66
22	144 27.6	107 13.0	25.6	222 15.8	24.2	358 42.6	57.3	263 16.8	36.7	97 17.0	76	19 31.0 +	65
23	159 30.1	122 12.7	26.6	237 16.4	24.1	13 45.3	57.4	278 19.3	36.7	111 43.6	75	19 37.5 +	64
17 0	174 32.5	137 12.5	+16 27.7	252 17.1	−23 24.0	28 48.0	+14 57.5	293 21.8	−18 36.7	126 10.1	74	+19 43.9 +	62
1	189 35.0	152 12.3	28.7	267 17.8	23.9	43 50.7	57.5	308 24.3	36.7	140 36.5	74	19 50.1 +	62
2	204 37.5	167 12.0	29.8	282 18.5	23.8	58 53.4	57.6	323 26.8	36.7	155 02.9	74	19 56.3 +	60
3	219 39.9	182 11.8	·· 30.8	297 19.2	·· 23.7	73 56.0	·· 57.7	338 29.2	·· 36.7	169 29.3	72	·20 02.3 +	59
4	234 42.4	197 11.6	31.9	312 19.9	23.6	88 58.7	57.8	353 31.7	36.6	183 55.5	72	20 08.2 +	58
5	249 44.9	212 11.4	32.9	327 20.6	23.5	104 01.4	57.8	8 34.2	36.6	198 21.7	72	20 14.0 +	57
6	264 47.3	227 11.1	+16 34.0	342 21.3	−23 23.4	119 04.1	+14 57.9	23 36.7	−18 36.6	212 47.9	71	+20 19.7 +	55
7	279 49.8	242 10.9	35.0	357 22.0	23.4	134 06.8	58.0	38 39.2	36.6	227 14.0	70	20 25.2 +	54
8	294 52.3	257 10.7	36.1	12 22.6	23.3	149 09.5	58.1	53 41.7	36.6	241 40.0	70	20 30.6 +	53
9	309 54.7	272 10.4	·· 37.1	27 23.3	·· 23.2	164 12.2	·· 58.1	68 44.1	·· 36.6	256 06.0	69	·20 35.9 +	52
10	324 57.2	287 10.2	38.2	42 24.0	23.1	179 14.9	58.2	83 46.6	36.6	270 31.9	68	20 41.1 +	50
11	339 59.6	302 09.9	39.2	57 24.7	23.0	194 17.6	58.3	98 49.1	36.6	284 57.7	68	20 46.1 +	50
12	355 02.1	317 09.7	+16 40.3	72 25.4	−23 22.9	209 20.3	+14 58.4	113 51.6	−18 36.6	299 23.5	68	+20 51.1 +	47
13	10 04.6	332 09.5	41.3	87 26.1	22.8	224 22.9	58.4	128 54.1	36.5	313 49.3	67	20 55.8 +	47
14	25 07.0	347 09.2	42.4	102 26.8	22.7	239 25.6	58.5	143 56.6	36.5	328 15.0	66	21 00.5 +	45
15	40 09.5	2 09.0	·· 43.4	117 27.5	·· 22.6	254 28.3	·· 58.6	158 59.1	·· 36.5	342 40.6	66	·21 05.0 +	44
16	55 12.0	17 08.8	44.4	132 28.2	22.5	269 31.0	58.6	174 01.5	36.5	357 06.2	65	21 09.4 +	43
17	70 14.4	32 08.5	45.5	147 28.8	22.4	284 33.7	58.7	189 04.0	36.5	11 31.7	65	21 13.7 +	41
18	85 16.9	47 08.3	+16 46.5	162 29.5	−23 22.3	299 36.4	+14 58.8	204 06.5	−18 36.5	25 57.2	64	+21 17.8 +	40
19	100 19.4	62 08.1	47.6	177 30.2	22.3	314 39.1	58.9	219 09.0	36.5	40 22.6	64	21 21.8 +	39
20	115 21.8	77 07.8	48.6	192 30.9	22.2	329 41.8	58.9	234 11.5	36.5	54 48.0	63	21 25.7 +	37
21	130 24.3	92 07.6	·· 49.7	207 31.6	·· 22.1	344 44.4	·· 59.0	249 14.0	·· 36.5	69 13.3	63	·21 29.4 +	36
22	145 26.8	107 07.4	50.7	222 32.3	22.0	359 47.1	59.1	264 16.5	36.4	83 38.6	63	21 33.0 +	35
23	160 29.2	122 07.1	51.7	237 33.0	21.9	14 49.8	59.1	279 19.0	36.4	98 03.9	62	21 36.5 +	33
18 0	175 31.7	137 06.9	+16 52.8	252 33.7	−23 21.8	29 52.5	+14 59.2	294 21.4	−18 36.4	112 29.1	61	+21 39.8 +	32
1	190 34.1	152 06.7	53.8	267 34.4	21.7	44 55.2	59.3	309 23.9	36.4	126 54.2	62	21 43.0 +	30
2	205 36.6	167 06.4	54.8	282 35.1	21.6	59 57.9	59.4	324 26.4	36.4	141 19.4	60	21 46.0 +	29
3	220 39.1	182 06.2	·· 55.9	297 35.7	·· 21.5	75 00.5	·· 59.4	339 28.9	·· 36.4	155 44.4	61	·21 48.9 +	28
4	235 41.5	197 06.0	56.9	312 36.4	21.4	90 03.2	59.5	354 31.4	36.4	170 09.5	60	21 51.7 +	26
5	250 44.0	212 05.7	58.0	327 37.1	21.3	105 05.9	59.6	9 33.9	36.4	184 34.5	59	21 54.3 +	25
6	265 46.5	227 05.5	+16 59.0	342 37.8	−23 21.2	120 08.6	+14 59.6	24 36.4	−18 36.4	198 59.4	60	+21 56.8 +	23
7	280 48.9	242 05.2	17 00.0	357 38.5	21.1	135 11.3	59.7	39 38.9	36.3	213 24.4	59	21 59.1 +	22
8	295 51.4	257 05.0	01.1	12 39.2	21.0	150 14.0	59.8	54 41.4	36.3	227 49.3	58	22 01.3 +	21
9	310 53.9	272 04.8	·· 02.1	27 39.9	·· 20.9	165 16.7	·· 59.9	69 43.8	·· 36.3	242 14.1	59	·22 03.4 +	19
10	325 56.3	287 04.5	03.1	42 40.6	20.8	180 19.3	14 59.9	84 46.3	36.3	256 39.0	58	22 05.3 +	18
11	340 58.8	302 04.3	04.2	57 41.3	20.7	195 22.0	15 00.0	99 48.8	36.3	271 03.8	57	22 07.1 +	16
12	356 01.2	317 04.1	+17 05.2	72 42.0	−23 20.6	210 24.7	+15 00.1	114 51.3	−18 36.3	285 28.5	58	+22 08.7 +	15
13	11 03.7	332 03.8	06.2	87 42.6	20.5	225 27.4	00.1	129 53.8	36.3	299 53.3	57	22 10.2 +	13
14	26 06.2	347 03.6	07.2	102 43.3	20.4	240 30.1	00.2	144 56.3	36.3	314 18.0	57	22 11.5 +	12
15	41 08.6	2 03.4	·· 08.3	117 44.0	·· 20.3	255 32.7	·· 00.3	159 58.8	·· 36.2	328 42.7	57	·22 12.7 +	11
16	56 11.1	17 03.1	09.3	132 44.7	20.2	270 35.4	00.4	175 01.3	36.2	343 07.4	56	22 13.8 +	9
17	71 13.6	32 02.9	10.3	147 45.4	20.1	285 38.1	00.4	190 03.8	36.2	357 32.0	56	22 14.7 +	8
18	86 16.0	47 02.6	+17 11.4	162 46.1	−23 20.0	300 40.8	+15 00.5	205 06.3	−18 36.2	11 56.6	56	+22 15.5 +	6
19	101 18.5	62 02.4	12.4	177 46.8	19.9	315 43.5	00.6	220 08.8	36.2	26 21.2	56	22 16.1 +	5
20	116 21.0	77 02.2	13.4	192 47.5	19.8	330 46.2	00.6	235 11.2	36.2	40 45.8	56	22 16.6 +	3
21	131 23.4	92 01.9	·· 14.4	207 48.2	·· 19.7	345 48.8	·· 00.7	250 13.7	·· 36.2	55 10.4	55	·22 16.9 +	2
22	146 25.9	107 01.7	15.4	222 48.9	19.6	0 51.5	00.8	265 16.2	36.2	69 34.9	56	22 17.1	0
23	161 28.4	122 01.5	16.5	237 49.6	19.5	15 54.2	00.8	280 18.7	36.2	83 59.5	55	22 17.1 −	1
24	176 30.8	137 01.2	+17 17.5	252 50.2	−23 19.4	30 56.9	+15 00.9	295 21.2	−18 36.1	98 24.0	55	+22 17.0 −	3
code	−	− 2	+ 10	+ 7	+ 1	+ 26	0	+ 25	+ 1				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
16 00	177 47.6	− 1 50.0	7	Acamar	315 51.1	−40 29.0
01	192 47.7	49.0	5	Achernar	335 59.1	−57 27.6
02	207 47.9	48.1	30	Acrux	173 56.7	−62 51.5
03	222 48.1	·· 47.1	19	Adhara	255 46.1	−28 55.0
04	237 48.3	46.1	10	Aldebaran	291 38.7	+16 25.3
05	252 48.4	45.1				
06	267 48.6	− 1 44.1	32	Alioth	166 57.7	+56 11.6
07	282 48.8	43.1	34	Alkaid	153 32.2	+49 31.6
08	297 49.0	42.1	55	Al Na'ir	28 37.9	−47 10.3
09	312 49.2	·· 41.1	15	Alnilam	276 29.9	− 1 13.9
10	327 49.3	40.2	25	Alphard	218 38.0	− 8 28.3
11	342 49.5	39.2				
12	357 49.7	− 1 38.2	41	Alphecca	126 47.1	+26 51.4
13	12 49.9	37.2	1	Alpheratz	358 28.3	+28 50.9
14	27 50.1	36.2	51	Altair	62 50.2	+ 8 45.0
15	42 50.2	·· 35.2	2	Ankaa	353 58.3	−42 32.6
16	57 50.4	34.2	42	Antares	113 18.8	−26 20.2
17	72 50.6	33.2				
18	87 50.8	− 1 32.2	37	Arcturus	146 34.6	+19 24.3
19	102 50.9	31.3	43	Atria	108 59.1	−68 56.8
20	117 51.1	30.3	22	Avior	234 35.2	−59 22.5
21	132 51.3	·· 29.3	13	Bellatrix	279 18.1	+ 6 18.6
22	147 51.5	28.3	16	Betelg'se	271 47.7	+ 7 23.9
23	162 51.7	27.3				
			17	Canopus	264 15.1	−52 40.6
17 00	177 51.8	− 1 26.3	12	Capella	281 37.9	+45 57.5
01	192 52.0	25.3	53	Deneb	50 01.0	+45 07.2
02	207 52.2	24.3	28	Denebola	183 17.0	+14 48.8
03	222 52.4	·· 23.4	4	Diphda	349 39.2	−18 13.6
04	237 52.6	22.4				
05	252 52.7	21.4	27	Dubhe	194 43.5	+61 59.1
06	267 52.9	− 1 20.4	14	Elnath	279 06.9	+28 34.4
07	282 53.1	19.4	47	Eltanin	91 06.1	+51 29.3
08	297 53.3	18.4	54	Enif	34 29.5	+ 9 40.4
09	312 53.5	·· 17.4	56	Fomalhaut	16 11.6	−29 51.2
10	327 53.6	16.4				
11	342 53.8	15.4	31	Gacrux	172 48.3	−56 52.2
12	357 54.0	− 1 14.5	29	Gienah	176 36.2	−17 18.2
13	12 54.2	13.5	35	Hadar	149 48.4	−60 09.8
14	27 54.4	12.5	6	Hamal	328 49.5	+23 15.4
15	42 54.6	·· 11.5	48	Kaus Aust.	84 40.7	−34 24.3
16	57 54.7	10.5				
17	72 54.9	09.5	40	Kochab	137 17.2	+74 19.8
18	87 55.1	− 1 08.5	57	Markab	14 21.4	+14 58.1
19	102 55.3	07.5	8	Menkar	315 00.1	+ 3 55.1
20	117 55.5	06.6	36	Menkent	148 57.9	−36 09.4
21	132 55.6	·· 05.6	24	Miapl'dus	221 48.2	−69 32.5
22	147 55.8	04.6				
23	162 56.0	03.6	9	Mirfak	309 42.1	+49 42.6
			50	Nunki	76 51.5	−26 21.1
18 00	177 56.2	− 1 02.6	52	Peacock	54 27.1	−56 52.4
01	192 56.4	01.6	21	Pollux	244 20.0	+28 07.9
02	207 56.6	1 00.6	20	Procyon	245 44.5	+ 5 20.1
03	222 56.7	· 0 59.6				
04	237 56.9	58.6	46	R'alhague	96 46.2	+12 35.3
05	252 57.1	57.7	26	Regulus	208 28.8	+12 10.7
06	267 57.3	− 0 56.7	11	Rigel	281 53.3	− 8 15.2
07	282 57.5	55.7	38	Rigil Kent.	140 50.0	−60 39.3
08	297 57.6	54.7	44	Sabik	103 01.7	−15 40.4
09	312 57.8	·· 53.7				
10	327 58.0	52.7	3	Schedar	350 30.1	+56 17.9
11	342 58.2	51.7	45	Shaula	97 20.1	−37 04.3
12	357 58.4	− 0 50.7	18	Sirius	259 11.5	−16 39.5
13	12 58.6	49.7	33	Spica	159 16.2	−10 56.2
14	27 58.7	48.8	23	Suhail	223 23.7	−43 15.6
15	42 58.9	·· 47.8				
16	57 59.1	46.8	49	Vega	81 08.1	+38 44.3
17	72 59.3	45.8	39	Zub'g'bi	137 52.7	−15 51.8
18	87 59.5	− 0 44.8				
19	102 59.7	43.8				
20	117 59.8	42.8				
21	133 00.0	·· 41.8				
22	148 00.2	40.9				
23	163 00.4	39.9				
24	178 00.6	− 0 38.9				
code	—	+ 10				

GMT	Equation of Time (App.−Mean) 16	17	18
h	m s	m s	m s
0	− 8 50.1	− 8 33.0	− 8 15.6
6	− 8 45.9	− 8 28.7	− 8 11.2
12	− 8 41.6	− 8 24.3	− 8 06.9
18	− 8 37.3	− 8 20.0	− 8 02.5
24	− 8 33.0	− 8 15.6	− 7 58.1

Lat.	Sunrise	Twlt. begins	Moonrise 16	17	18	19
N °	h m	h m	h m	h m	h m	h m
72	6 14	1 41	4 06	□	□	□
70	6 13	2 25	5 00	3 53	□	□
68	6 13	2 52	5 33	5 27	5 17	□
66	6 12	3 12	5 57	6 06	6 29	7 22
64	6 12	3 27	6 16	6 34	7 05	8 01
62	6 11	3 39	6 32	6 55	7 32	8 29
60	6 11	3 50	6 45	7 12	7 52	8 50
58	6 11	3 58	6 57	7 27	8 09	9 07
56	6 10	4 06	7 07	7 39	8 24	9 22
54	6 10	4 12	7 15	7 50	8 36	9 34
52	6 10	4 18	7 23	8 00	8 47	9 45
50	6 09	4 23	7 30	8 09	8 57	9 55
45	6 09	4 33	7 46	8 27	9 17	10 16
40	6 08	4 39	7 58	8 42	9 34	10 33
35	6 08	4 45	8 09	8 55	9 48	10 47
30	6 08	4 49	8 19	9 06	10 00	10 59
20	6 07	4 55	8 35	9 26	10 21	11 20
10	6 06	4 57	8 50	9 43	10 39	11 38
0	6 05	4 56	9 03	9 58	10 56	11 55
10	6 04	4 54	9 17	10 14	11 13	12 12
20	6 03	4 50	9 31	10 31	11 32	12 31
30	6 01	4 41	9 48	10 51	11 53	12 52
35	6 01	4 35	9 58	11 03	12 05	13 04
40	5 59	4 28	10 09	11 16	12 20	13 18
45	5 58	4 17	10 23	11 32	12 37	13 35
50	5 57	4 04	10 39	11 51	12 58	13 56
52	5 56	3 58	10 47	12 00	13 08	14 06
54	5 55	3 50	10 55	12 11	13 19	14 17
56	5 54	3 42	11 05	12 22	13 32	14 29
58	5 53	3 32	11 16	12 36	13 47	14 44
60 S	5 52	3 21	11 29	12 52	14 05	15 01

Lat.	Sunset	Twlt. ends	Moonset 16	17	18	19
N °	h m	h m	h m	h m	h m	h m
72	18 05	22 52	1 16	□	□	□
70	18 06	22 03	0 24	3 28	□	□
68	18 06	21 33	25 51	1 51	4 01	□
66	18 07	21 12	25 13	1 13	2 49	3 59
64	18 07	20 56	24 45	0 45	2 13	3 20
62	18 07	20 43	24 25	0 25	1 47	2 52
60	18 07	20 31	24 08	0 08	1 26	2 31
58	18 07	20 22	23 54	25 10	1 10	2 14
56	18 08	20 15	23 42	24 56	0 56	1 59
54	18 08	20 08	23 31	24 43	0 43	1 46
52	18 08	20 02	23 22	24 33	0 33	1 35
50	18 08	19 57	23 13	24 23	0 23	1 25
45	18 09	19 48	22 56	24 03	0 03	1 05
40	18 09	19 40	22 41	23 47	24 48	0 48
35	18 09	19 33	22 29	23 33	24 34	0 34
30	18 10	19 30	22 18	23 21	24 21	0 21
20	18 10	19 23	22 00	23 00	24 00	0 00
10	18 11	19 21	21 44	22 43	23 42	24 40
0	18 12	19 21	21 29	22 26	23 24	24 23
10	18 13	19 23	21 14	22 09	23 07	24 07
20	18 14	19 27	20 58	21 51	22 49	23 49
30	18 15	19 35	20 40	21 31	22 27	23 29
35	18 16	19 41	20 30	21 19	22 15	23 16
40	18 17	19 48	20 18	21 05	22 00	23 03
45	18 18	19 57	20 04	20 49	21 43	22 46
50	18 19	20 09	19 47	20 29	21 22	22 26
52	18 20	20 16	19 38	20 20	21 12	22 16
54	18 20	20 22	19 29	20 09	21 01	22 05
56	18 21	20 31	19 19	19 57	20 48	21 53
58	18 22	20 40	19 08	19 43	20 33	21 38
60 S	18 23	20 51	18 55	19 27	20 15	21 21

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
16	15 16	14 51	7 12	22 05	4 30
17	16 12	14 51	7 11	22 01	4 26
18	17 10	14 52	7 09	21 57	4 22
19	18 09	14 52	7 08	21 52	4 18

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.4	0.2	0.1
30	0.4	0.1	0.1
45	0.4	0.1	0.1
60	0.4	0.1	0.0
75	0.4	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	16	17	18
°	′	′	′
0	17.1	17.6	18.0
4	17.1	17.6	18.0
8	17.1	17.6	17.9
12	17.0	17.5	17.9
16	17.0	17.5	17.9
20	17.0	17.5	17.8
24	17.0	17.4	17.8
28	16.9	17.4	17.7
32	16.9	17.3	17.6
36	16.8	17.2	17.6
40	16.8	17.2	17.5
44	16.7	17.1	17.4
48	16.6	17.0	17.3
52	16.6	16.9	17.2
56	16.5	16.8	17.1
60	16.4	16.7	17.0
64	16.4	16.6	16.8
68	16.3	16.5	16.7
72	16.2	16.4	16.6
76	16.1	16.3	16.5
80	16.0	16.2	16.3
84	16.0	16.1	16.2
88	15.9	16.0	16.1
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	16	17	18
°	′	′	′
0	14.7	14.4	14.2
4	14.7	14.4	14.2
8	14.7	14.4	14.2
12	14.7	14.4	14.2
16	14.7	14.5	14.3
20	14.8	14.5	14.3
24	14.8	14.5	14.4
28	14.8	14.6	14.4
32	14.9	14.7	14.5
36	14.9	14.7	14.6
40	15.0	14.8	14.7
44	15.0	14.9	14.7
48	15.1	15.0	14.8
52	15.2	15.0	15.0
56	15.2	15.1	15.1
60	15.3	15.2	15.2
64	15.4	15.3	15.3
68	15.5	15.4	15.4
72	15.5	15.5	15.5
76	15.6	15.7	15.7
80	15.7	15.8	15.8
84	15.8	15.9	15.9
88	15.9	16.0	16.0
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.8 GHA	VENUS −3.8 Dec.	MARS 0.9 GHA	MARS 0.9 Dec.	JUPITER −2.0 GHA	JUPITER −2.0 Dec.	SATURN 0.6 GHA	SATURN 0.6 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
19 0	176 30.8	137 01.2	+17 17.5	252 50.2	−23 19.4	30 56.9	+15 00.9	295 21.2	−18 36.1	98 24.0	55	+22 17.0	− 3
1	191 33.3	152 01.0	18.5	267 50.9	19.3	45 59.5	01.0	310 23.7	36.1	112 48.5	55	22 16.7	− 4
2	206 35.7	167 00.7	19.5	282 51.6	19.2	61 02.2	01.1	325 26.2	36.1	127 13.0	55	22 16.3	− 6
3	221 38.2	182 00.5	·· 20.6	297 52.3	·· 19.1	76 04.9	·· 01.1	340 28.7	·· 36.1	141 37.5	55	·22 15.7	− 7
4	236 40.7	197 00.3	21.6	312 53.0	19.0	91 07.6	01.2	355 31.2	36.1	156 02.0	55	22 15.0	− 8
5	251 43.1	212 00.0	· 22.6	327 53.7	18.9	106 10.3	01.3	10 33.7	36.1	170 26.5	55	22 14.2	− 10
6	266 45.6	226 59.8	+17 23.6	342 54.4	−23 18.8	121 12.9	+15 01.3	25 36.2	−18 36.1	184 51.0	55	+22 13.2	− 12
7	281 48.1	241 59.6	24.6	357 55.1	18.7	136 15.6	01.4	40 38.7	36.1	199 15.5	54	22 12.0	− 13
8	296 50.5	256 59.3	25.7	12 55.8	18.6	151 18.3	01.5	55 41.2	36.0	213 39.9	55	22 10.7	− 14
9	311 53.0	271 59.1	·· 26.7	27 56.5	·· 18.5	166 21.0	·· 01.5	70 43.7	·· 36.0	228 04.4	55	·22 09.3	− 16
10	326 55.5	286 58.8	27.7	42 57.2	18.4	181 23.7	01.6	85 46.2	36.0	242 28.9	55	22 07.7	− 17
11	341 57.9	301 58.6	28.7	57 57.9	18.2	196 26.3	01.7	100 48.6	36.0	256 53.4	55	22 06.0	− 19
12	357 00.4	316 58.4	+17 29.7	72 58.6	−23 18.1	211 29.0	+15 01.7	115 51.1	−18 36.0	271 17.9	55	+22 04.1	− 21
13	12 02.9	331 58.1	30.7	87 59.2	18.0	226 31.7	01.8	130 53.6	36.0	285 42.4	55	22 02.0	− 21
14	27 05.3	346 57.9	31.7	102 59.9	17.9	241 34.4	01.9	145 56.1	36.0	300 06.9	55	21 59.9	− 24
15	42 07.8	1 57.7	·· 32.8	118 00.6	·· 17.8	256 37.0	·· 02.0	160 58.6	·· 36.0	314 31.4	55	·21 57.5	− 24
16	57 10.2	16 57.4	33.8	133 01.3	17.7	271 39.7	02.0	176 01.1	35.9	328 55.9	55	21 55.1	− 26
17	72 12.7	31 57.2	34.8	148 02.0	17.6	286 42.4	02.1	191 03.6	35.9	343 20.4	55	21 52.5	− 28
18	87 15.2	46 56.9	+17 35.8	163 02.7	−23 17.5	301 45.1	+15 02.2	206 06.1	−18 35.9	357 44.9	56	+21 49.7	− 29
19	102 17.6	61 56.7	36.8	178 03.4	17.4	316 47.7	02.2	221 08.6	35.9	12 09.5	56	21 46.8	− 31
20	117 20.1	76 56.5	37.8	193 04.1	17.3	331 50.4	02.3	236 11.1	35.9	26 34.1	56	21 43.7	− 32
21	132 22.6	91 56.2	·· 38.8	208 04.8	·· 17.2	346 53.1	·· 02.4	251 13.6	·· 35.9	40 58.7	56	·21 40.5	− 33
22	147 25.0	106 56.0	39.8	223 05.5	17.1	1 55.8	02.4	266 16.1	35.9	55 23.3	56	21 37.2	− 35
23	162 27.5	121 55.7	40.8	238 06.2	17.0	16 58.4	02.5	281 18.6	35.9	69 47.9	56	21 33.7	− 36
20 0	177 30.0	136 55.5	+17 41.8	253 06.9	−23 16.8	32 01.1	+15 02.6	296 21.1	−18 35.8	84 12.5	57	+21 30.1	− 38
1	192 32.4	151 55.3	42.8	268 07.6	16.7	47 03.8	02.6	311 23.6	35.8	98 37.2	57	21 26.3	− 39
2	207 34.9	166 55.0	43.8	283 08.3	16.6	62 06.4	02.7	326 26.1	35.8	113 01.9	57	21 22.4	− 40
3	222 37.3	181 54.8	·· 44.8	298 08.9	·· 16.5	77 09.1	·· 02.8	341 28.6	·· 35.8	127 26.6	57	·21 18.4	− 42
4	237 39.8	196 54.5	45.8	313 09.6	16.4	92 11.8	02.8	356 31.1	35.8	141 51.3	58	21 14.2	− 44
5	252 42.3	211 54.3	46.9	328 10.3	16.3	107 14.5	02.9	11 33.6	35.8	156 16.1	58	21 09.8	− 44
6	267 44.7	226 54.1	+17 47.9	343 11.0	−23 16.2	122 17.1	+15 03.0	26 36.1	−18 35.8	170 40.9	58	+21 05.4	− 47
7	282 47.2	241 53.8	48.9	358 11.7	16.1	137 19.8	03.0	41 38.6	35.7	185 05.7	58	21 00.7	− 47
8	297 49.7	256 53.6	49.9	13 12.4	16.0	152 22.5	03.1	56 41.1	35.7	199 30.5	59	20 56.0	− 49
9	312 52.1	271 53.3	·· 50.9	28 13.1	·· 15.8	167 25.1	·· 03.2	71 43.6	·· 35.7	213 55.4	59	·20 51.1	− 50
10	327 54.6	286 53.1	51.9	43 13.8	15.7	182 27.8	03.2	86 46.1	35.7	228 20.3	60	20 46.1	− 52
11	342 57.1	301 52.9	52.9	58 14.5	15.6	197 30.5	03.3	101 48.6	35.7	242 45.3	59	20 40.9	− 53
12	357 59.5	316 52.6	+17 53.9	73 15.2	−23 15.5	212 33.2	+15 03.4	116 51.1	−18 35.7	257 10.2	61	+20 35.6	− 54
13	13 02.0	331 52.4	54.8	88 15.9	15.4	227 35.8	03.4	131 53.6	35.7	271 35.3	60	20 30.2	− 56
14	28 04.5	346 52.1	55.8	103 16.6	15.3	242 38.5	03.5	146 56.1	35.7	286 00.3	61	20 24.6	− 57
15	43 06.9	1 51.9	·· 56.8	118 17.3	·· 15.2	257 41.2	·· 03.6	161 58.6	·· 35.6	300 25.4	61	·20 18.9	− 59
16	58 09.4	16 51.7	57.8	133 18.0	15.0	272 43.8	03.6	177 01.1	35.6	314 50.5	62	20 13.0	− 59
17	73 11.8	31 51.4	58.8	148 18.7	14.9	287 46.5	03.7	192 03.6	35.6	329 15.7	62	20 07.1	− 61
18	88 14.3	46 51.2	+17 59.8	163 19.4	−23 14.8	302 49.2	+15 03.8	207 06.1	−18 35.6	343 40.9	62	+20 01.0	− 63
19	103 16.8	61 50.9	18 00.8	178 20.1	14.7	317 51.8	03.8	222 08.6	35.6	358 06.1	63	19 54.7	− 63
20	118 19.2	76 50.7	01.8	193 20.8	14.6	332 54.5	03.9	237 11.1	35.6	12 31.4	63	19 48.4	− 65
21	133 21.7	91 50.5	·· 02.8	208 21.4	·· 14.5	347 57.2	·· 04.0	252 13.6	·· 35.6	26 56.7	64	·19 41.9	− 67
22	148 24.2	106 50.2	03.8	223 22.1	14.4	2 59.8	04.0	267 16.1	35.6	41 22.1	64	19 35.2	− 67
23	163 26.6	121 50.0	04.8	238 22.8	14.2	18 02.5	04.1	282 18.6	35.5	55 47.5	65	19 28.5	− 69
21 0	178 29.1	136 49.7	+18 05.8	253 23.5	−23 14.1	33 05.2	+15 04.1	297 21.1	−18 35.5	70 13.0	65	+19 21.6	− 70
1	193 31.6	151 49.5	06.8	268 24.2	14.0	48 07.8	04.2	312 23.6	35.5	84 38.5	65	19 14.6	− 71
2	208 34.0	166 49.3	07.7	283 24.9	13.9	63 10.5	04.3	327 26.1	35.5	99 04.0	66	19 07.5	− 73
3	223 36.5	181 49.0	·· 08.7	298 25.6	·· 13.8	78 13.2	·· 04.3	342 28.6	·· 35.5	113 29.6	67	·19 00.2	− 74
4	238 39.0	196 48.8	09.7	313 26.3	13.6	93 15.8	04.4	357 31.1	35.5	127 55.3	66	18 52.8	− 75
5	253 41.4	211 48.5	10.7	328 27.0	13.5	108 18.5	04.5	12 33.6	35.5	142 20.9	68	18 45.3	− 76
6	268 43.9	226 48.3	+18 11.7	343 27.7	−23 13.4	123 21.2	+15 04.5	27 36.1	−18 35.4	156 46.7	68	+18 37.7	− 77
7	283 46.3	241 48.1	12.7	358 28.4	13.3	138 23.8	04.6	42 38.6	35.4	171 12.5	68	18 30.0	− 79
8	298 48.8	256 47.8	13.7	13 29.1	13.2	153 26.5	04.7	57 41.1	35.4	185 38.3	69	18 22.1	− 80
9	313 51.3	271 47.6	·· 14.6	28 29.8	·· 13.0	168 29.2	·· 04.7	72 43.6	·· 35.4	200 04.2	69	·18 14.1	− 80
10	328 53.7	286 47.3	15.6	43 30.5	12.9	183 31.8	04.8	87 46.1	35.4	214 30.1	70	18 06.1	− 82
11	343 56.2	301 47.1	16.6	58 31.2	12.8	198 34.5	04.9	102 48.6	35.4	228 56.1	71	17 57.9	− 84
12	358 58.7	316 46.8	+18 17.6	73 31.9	−23 12.7	213 37.2	+15 04.9	117 51.1	−18 35.4	243 22.2	71	+17 49.5	− 84
13	14 01.1	331 46.6	18.6	88 32.6	12.6	228 39.8	05.0	132 53.6	35.3	257 48.3	71	17 41.1	− 86
14	29 03.6	346 46.4	19.5	103 33.3	12.4	243 42.5	05.0	147 56.1	35.3	272 14.4	72	17 32.5	− 86
15	44 06.1	1 46.1	·· 20.5	118 34.0	·· 12.3	258 45.1	·· 05.1	162 58.6	·· 35.3	286 40.6	73	·17 23.9	− 88
16	59 08.5	16 45.9	21.5	133 34.7	12.2	273 47.8	05.2	178 01.1	35.3	301 06.9	73	17 15.1	− 89
17	74 11.0	31 45.6	22.5	148 35.4	12.1	288 50.5	05.2	193 03.6	35.3	315 33.2	73	17 06.2	− 89
18	89 13.4	46 45.4	+18 23.5	163 36.1	−23 12.0	303 53.1	+15 05.3	208 06.1	−18 35.3	329 59.5	74	+16 57.3	− 91
19	104 15.9	61 45.1	24.4	178 36.8	11.8	318 55.8	05.4	223 08.6	35.3	344 25.9	75	16 48.2	− 92
20	119 18.4	76 44.9	25.4	193 37.5	11.7	333 58.5	05.4	238 11.1	35.2	358 52.4	75	16 39.0	− 93
21	134 20.8	91 44.7	·· 26.4	208 38.2	·· 11.6	349 01.1	·· 05.5	253 13.6	·· 35.2	13 18.9	76	·16 29.7	− 94
22	149 23.3	106 44.4	27.4	223 38.8	11.5	4 03.8	05.6	268 16.1	35.2	27 45.5	76	16 20.3	− 95
23	164 25.8	121 44.2	28.3	238 39.5	11.3	19 06.4	05.6	283 18.6	35.2	42 12.1	77	16 10.8	− 96
24	179 28.2	136 43.9	+18 29.3	253 40.2	−23 11.2	34 09.1	+15 05.7	298 21.1	−18 35.2	56 38.8	78	+16 01.2	− 97
code	—	− 2	+ 9	+ 7	+ 1	+ 26	0	+ 25	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
19 0	178 00.6	− 0 38.9
1	193 00.8	37.9
2	208 00.9	36.9
3	223 01.1	35.9
4	238 01.3	34.9
5	253 01.5	33.9
6	268 01.7	− 0 32.9
7	283 01.9	32.0
8	298 02.1	31.0
9	313 02.2	30.0
10	328 02.4	29.0
11	343 02.6	28.0
12	358 02.8	− 0 27.0
13	13 03.0	26.0
14	28 03.2	25.0
15	43 03.3	24.1
16	58 03.5	23.1
17	73 03.7	22.1
18	88 03.9	− 0 21.1
19	103 04.1	20.1
20	118 04.3	19.1
21	133 04.5	18.1
22	148 04.6	17.1
23	163 04.8	16.1
20 0	178 05.0	− 0 15.2
1	193 05.2	14.2
2	208 05.4	13.2
3	223 05.6	12.2
4	238 05.8	11.2
5	253 05.9	10.2
6	268 06.1	− 0 09.2
7	283 06.3	08.2
8	298 06.5	07.3
9	313 06.7	06.3
10	328 06.9	05.3
11	343 07.1	04.3
12	358 07.2	− 0 03.3
13	13 07.4	02.3
14	28 07.6	01.3
15	43 07.8	− 0 00.3
16	58 08.0	+ 0 00.6
17	73 08.2	01.6
18	88 08.4	+ 0 02.6
19	103 08.5	03.6
20	118 08.7	04.6
21	133 08.9	05.6
22	148 09.1	06.6
23	163 09.3	07.6
21 0	178 09.5	+ 0 08.5
1	193 09.7	09.5
2	208 09.9	10.5
3	223 10.0	11.5
4	238 10.2	12.5
5	253 10.4	13.5
6	268 10.6	+ 0 14.5
7	283 10.8	15.5
8	298 11.0	16.4
9	313 11.2	17.4
10	328 11.4	18.4
11	343 11.5	19.4
12	358 11.7	+ 0 20.4
13	13 11.9	21.4
14	28 12.1	22.4
15	43 12.3	23.3
16	58 12.5	24.3
17	73 12.7	25.3
18	88 12.9	+ 0 26.3
19	103 13.0	27.3
20	118 13.2	28.3
21	133 13.4	29.3
22	148 13.6	30.3
23	163 13.8	31.2
24	178 14.0	+ 0 32.2
code	−	+ 10

STARS No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 51.1	−40 28.9
5	Achernar	335 59.1	−57 27.6
30	Acrux	173 56.7	−62 51.5
19	Adhara	255 46.2	−28 55.0
10	Aldebaran	291 38.8	+16 25.3
32	Alioth	166 57.7	+56 11.6
34	Alkaid	153 32.2	+49 31.6
55	Al Na'ir	28 37.9	−47 10.3
15	Alnilam	276 29.9	− 1 13.9
25	Alphard	218 38.0	− 8 28.3
41	Alphecca	126 47.1	+26 51.4
1	Alpheratz	358 28.3	+28 50.9
51	Altair	62 50.2	+ 8 45.0
2	Ankaa	353 58.3	−42 32.6
42	Antares	113 18.8	−26 20.2
37	Arcturus	146 34.6	+19 24.3
43	Atria	108 59.0	−68 56.8
22	Avior	234 35.3	−59 22.5
13	Bellatrix	279 18.1	+ 6 18.6
16	Betelg'se	271 47.7	+ 7 23.9
17	Canopus	264 15.2	−52 40.6
12	Capella	281 38.0	+45 57.5
53	Deneb	50 01.0	+45 07.2
28	Denebola	183 17.0	+14 48.8
4	Diphda	349 39.2	−18 13.6
27	Dubhe	194 43.5	+61 59.2
14	Elnath	279 06.9	+28 34.3
47	Eltanin	91 06.1	+51 29.3
54	Enif	34 29.5	+ 9 40.4
56	Fomalhaut	16 11.6	−29 51.2
31	Gacrux	172 48.2	−56 52.2
29	Gienah	176 36.1	−17 18.2
35	Hadar	149 48.3	−60 09.8
6	Hamal	328 49.5	+23 15.4
48	Kaus Aust.	84 40.7	−34 24.3
40	Kochab	137 17.1	+74 19.8
57	Markab	14 21.4	+14 58.1
8	Menkar	315 00.1	+ 3 55.1
36	Menkent	148 57.9	−36 09.4
24	Miapl'dus	221 48.3	−69 32.5
9	Mirfak	309 42.2	+49 42.6
50	Nunki	76 51.5	−26 21.1
52	Peacock	54 27.0	−56 52.4
21	Pollux	244 20.0	+28 07.9
20	Procyon	245 44.5	+ 5 20.1
46	R'alhague	96 46.2	+12 35.3
26	Regulus	208 28.8	+12 10.7
11	Rigel	281 53.3	− 8 15.2
38	Rigil Kent.	140 49.9	−60 39.4
44	Sabik	103 01.7	−15 40.4
3	Schedar	350 30.1	+56 17.9
45	Shaula	97 20.1	−37 04.3
18	Sirius	259 11.5	−16 39.6
33	Spica	159 16.2	−10 56.2
23	Suhail	223 23.7	−43 15.6
49	Vega	81 08.1	+38 44.3
39	Zub'g'bi	137 52.7	−15 51.8

GMT	Equation of Time (App.−Mean) 19	20	21
h	m s	m s	m s
0	− 7 58.1	− 7 40.3	− 7 22.4
6	− 7 53.6	− 7 35.9	− 7 17.9
12	− 7 49.2	− 7 31.4	− 7 13.4
18	− 7 44.8	− 7 26.9	− 7 08.9
24	− 7 40.3	− 7 22.4	− 7 04.4

Lat. N °	Sunrise h m	Twlt. begins h m	Moonrise 19 h m	20 h m	21 h m	22 h m
72	5 58	0 40	□	□	□	11 19
70	5 59	1 58	□	□	9 27	11 49
68	6 00	2 32	□	8 03	10 10	12 11
66	6 00	2 55	7 22	8 52	10 38	12 28
64	6 01	3 13	8 01	9 23	11 00	12 42
62	6 01	3 28	8 29	9 46	11 17	12 53
60	6 02	3 39	8 50	10 04	11 31	13 03
58	6 02	3 49	9 07	10 20	11 43	13 11
56	6 02	3 57	9 22	10 33	11 54	13 19
54	6 03	4 04	9 34	10 44	12 03	13 26
52	6 03	4 10	9 45	10 54	12 11	13 32
50	6 03	4 15	9 55	11 03	12 18	13 37
45	6 03	4 26	10 16	11 22	12 34	13 48
40	6 04	4 34	10 33	11 38	12 47	13 58
35	6 04	4 40	10 47	11 51	12 58	14 06
30	6 04	4 45	10 59	12 02	13 07	14 13
20	6 04	4 52	11 20	12 21	13 24	14 26
10	6 04	4 55	11 38	12 38	13 38	14 36
0	6 04	4 56	11 55	12 54	13 51	14 47
10	6 04	4 54	12 12	13 10	14 05	14 57
20	6 04	4 51	12 31	13 27	14 19	15 07
30	6 03	4 43	12 52	13 46	14 35	15 19
35	6 03	4 37	13 04	13 57	14 44	15 26
40	6 03	4 31	13 18	14 10	14 55	15 34
45	6 02	4 22	13 35	14 25	15 08	15 43
50	6 02	4 10	13 56	14 44	15 23	15 55
52	6 02	4 05	14 06	14 52	15 30	16 00
54	6 01	3 58	14 17	15 02	15 38	16 05
56	6 01	3 51	14 29	15 13	15 46	16 12
58	6 01	3 41	14 44	15 26	15 56	16 19
60	6 00	3 32	15 01	15 41	16 08	16 26

Lat. N °	Sunset h m	Twlt. ends h m	Moonset 19 h m	20 h m	21 h m	22 h m
72	18 19	////	□	□	□	6 06
70	18 18	22 30	□	□	5 59	5 34
68	18 17	21 52	□	5 22	5 16	5 11
66	18 16	21 27	3 59	4 33	4 47	4 53
64	18 16	21 09	3 20	4 02	4 25	4 38
62	18 15	20 53	2 52	3 38	4 07	4 25
60	18 15	20 41	2 31	3 19	3 52	4 15
58	18 14	20 31	2 14	3 03	3 39	4 05
56	18 14	20 23	1 59	2 50	3 28	3 57
54	18 13	20 15	1 46	2 38	3 18	3 50
52	18 13	20 08	1 35	2 28	3 10	3 43
50	18 13	20 03	1 25	2 19	3 02	3 37
45	18 12	19 51	1 05	1 59	2 45	3 24
40	18 12	19 43	0 48	1 43	2 31	3 13
35	18 12	19 37	0 34	1 30	2 20	3 04
30	18 11	19 31	0 21	1 18	2 09	2 56
20	18 11	19 24	0 00	0 58	1 52	2 42
10	18 11	19 21	24 40	0 40	1 36	2 30
0	18 11	19 20	24 23	0 23	1 22	2 18
10	18 11	19 21	24 07	0 07	1 07	2 06
20	18 11	19 24	23 49	24 51	0 51	1 53
30	18 11	19 31	23 29	24 33	0 33	1 39
35	18 11	19 36	23 16	24 22	0 22	1 30
40	18 11	19 42	23 03	24 10	0 10	1 21
45	18 12	19 51	22 46	23 56	25 09	1 09
50	18 12	20 02	22 26	23 38	24 55	0 55
52	18 12	20 07	22 16	23 30	24 49	0 49
54	18 13	20 14	22 05	23 20	24 41	0 41
56	18 13	20 21	21 53	23 10	24 33	0 33
58	18 13	20 29	21 38	22 57	24 24	0 24
60	18 13	20 38	21 21	22 43	24 13	0 13

GMT of Transit
Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
19	18 09	14 52	7 08	21 52	4 18
20	19 08	14 53	7 07	21 48	4 14
21	20 05	14 53	7 06	21 44	4 10
22	20 59	14 53	7 05	21 40	4 06

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.4	0.2	0.1
30	0.4	0.1	0.1
45	0.4	0.1	0.1
60	0.4	0.1	0.0
75	0.4	0.0	0.0
90	0.4	0.0	0.0

Moon's Lower Limb **Add**

Alt. °	19 ′	20 ′	21 ′
0	18.2	18.5	18.6
4	18.2	18.5	18.6
8	18.2	18.4	18.6
12	18.2	18.4	18.5
16	18.1	18.4	18.5
20	18.1	18.3	18.4
24	18.0	18.2	18.4
28	17.9	18.2	18.3
32	17.9	18.1	18.2
36	17.8	18.0	18.1
40	17.7	17.9	18.0
44	17.6	17.8	17.9
48	17.5	17.7	17.7
52	17.4	17.5	17.6
56	17.2	17.4	17.5
60	17.1	17.3	17.3
64	17.0	17.1	17.2
68	16.8	17.0	17.0
72	16.7	16.8	16.9
76	16.6	16.7	16.7
80	16.4	16.5	16.5
84	16.3	16.3	16.4
88	16.2	16.2	16.2
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt. °	19 ′	20 ′	21 ′
0	14.0	13.9	13.8
4	14.0	13.9	13.8
8	14.1	13.9	13.8
12	14.1	13.9	13.9
16	14.1	14.0	13.9
20	14.2	14.0	14.0
24	14.2	14.1	14.0
28	14.3	14.2	14.1
32	14.4	14.3	14.2
36	14.5	14.4	14.3
40	14.6	14.5	14.4
44	14.7	14.6	14.5
48	14.8	14.7	14.7
52	14.9	14.8	14.8
56	15.0	15.0	14.9
60	15.1	15.1	15.1
64	15.3	15.2	15.2
68	15.4	15.4	15.4
72	15.5	15.5	15.5
76	15.7	15.7	15.7
80	15.8	15.9	15.9
84	16.0	16.0	16.0
88	16.1	16.1	16.2
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.8 GHA	VENUS −3.8 Dec	MARS 0.9 GHA	MARS 0.9 Dec	JUPITER −2.0 GHA	JUPITER −2.0 Dec	SATURN 0.6 GHA	SATURN 0.6 Dec	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
22 0	179 28.2	136 43.9	+18 29.3	253 40.2	−23 11.2	34 09.1	+15 05.7	298 21.1	−18 35.2	56 38.8	78	+16 01.2	− 97
1	194 30.7	151 43.7	30.3	268 40.9	11.1	49 11.8	05.7	313 23.6	35.2	71 05.6	78	15 51.5	− 98
2	209 33.2	166 43.4	31.2	283 41.6	11.0	64 14.4	05.8	328 26.2	35.2	85 32.4	78	15 41.7	− 99
3	224 35.6	181 43.2	·· 32.2	298 42.3	·· 10.8	79 17.1	·· 05.9	343 28.7	·· 35.1	99 59.2	79	·15 31.8	−100
4	239 38.1	196 43.0	33.2	313 43.0	10.7	94 19.7	05.9	358 31.2	35.1	114 26.1	80	15 21.8	−101
5	254 40.6	211 42.7	34.1	328 43.7	10.6	109 22.4	06.0	13 33.7	35.1	128 53.1	80	15 11.7	−102
6	269 43.0	226 42.5	+18 35.1	343 44.4	−23 10.5	124 25.1	+15 06.1	28 36.2	−18 35.1	143 20.1	81	+15 01.5	−103
7	284 45.5	241 42.2	36.1	358 45.1	10.3	139 27.7	06.1	43 38.7	35.1	157 47.2	81	14 51.2	−103
8	299 47.9	256 42.0	37.0	13 45.8	10.2	154 30.4	06.2	58 41.2	35.1	172 14.3	82	14 40.9	−105
9	314 50.4	271 41.7	·· 38.0	28 46.5	·· 10.1	169 33.0	·· 06.2	73 43.7	·· 35.1	186 41.5	82	·14 30.4	−105
10	329 52.9	286 41.5	39.0	43 47.2	10.0	184 35.7	06.3	88 46.2	35.0	201 08.7	83	14 19.9	−106
11	344 55.3	301 41.3	39.9	58 47.9	09.8	199 38.3	06.4	103 48.7	35.0	215 36.0	84	14 09.3	−107
12	359 57.8	316 41.0	+18 40.9	73 48.6	−23 09.7	214 41.0	+15 06.4	118 51.2	−18 35.0	230 03.4	84	+13 58.6	−108
13	15 00.3	331 40.8	41.9	88 49.3	09.6	229 43.7	06.5	133 53.7	35.0	244 30.8	85	13 47.8	−109
14	30 02.7	346 40.5	42.8	103 50.0	09.4	244 46.3	06.5	148 56.2	35.0	258 58.3	85	13 36.9	−109
15	45 05.2	1 40.3	·· 43.8	118 50.7	·· 09.3	259 49.0	·· 06.6	163 58.7	·· 35.0	273 25.8	85	·13 26.0	−111
16	60 07.7	16 40.0	44.7	133 51.4	09.2	274 51.6	06.7	179 01.2	35.0	287 53.3	87	13 14.9	−111
17	75 10.1	31 39.8	45.7	148 52.1	09.1	289 54.3	06.7	194 03.8	34.9	302 21.0	86	13 03.8	−112
18	90 12.6	46 39.6	+18 46.7	163 52.8	−23 08.9	304 56.9	+15 06.8	209 06.3	−18 34.9	316 48.6	88	+12 52.6	−113
19	105 15.0	61 39.3	47.6	178 53.5	08.8	319 59.6	06.9	224 08.8	34.9	331 16.4	88	12 41.3	−113
20	120 17.5	76 39.1	48.6	193 54.2	08.7	335 02.3	06.9	239 11.3	34.9	345 44.2	88	12 30.0	−114
21	135 20.0	91 38.8	·· 49.5	208 54.9	·· 08.5	350 04.9	·· 07.0	254 13.8	·· 34.9	0 12.0	89	·12 18.6	−115
22	150 22.4	106 38.6	50.5	223 55.6	08.4	5 07.6	07.0	269 16.3	34.9	14 39.9	89	12 07.1	−115
23	165 24.9	121 38.3	51.5	238 56.3	08.3	20 10.2	07.1	284 18.8	34.9	29 07.8	90	11 55.6	−117
23 0	180 27.4	136 38.1	+18 52.4	253 57.0	−23 08.1	35 12.9	+15 07.2	299 21.3	−18 34.8	43 35.8	91	+11 43.9	−116
1	195 29.8	151 37.8	53.4	268 57.7	08.0	50 15.5	07.2	314 23.8	34.8	58 03.9	91	11 32.3	−118
2	210 32.3	166 37.6	54.3	283 58.4	07.9	65 18.2	07.3	329 26.3	34.8	72 32.0	91	11 20.5	−118
3	225 34.8	181 37.4	·· 55.3	298 59.1	·· 07.8	80 20.8	·· 07.3	344 28.9	·· 34.8	87 00.1	92	·11 08.7	−119
4	240 37.2	196 37.1	56.2	313 59.8	07.6	95 23.5	07.4	359 31.4	34.8	101 28.3	93	10 56.8	−119
5	255 39.7	211 36.9	57.2	329 00.5	07.5	110 26.1	07.5	14 33.9	34.8	115 56.6	93	10 44.9	−120
6	270 42.2	226 36.6	+18 58.1	344 01.2	−23 07.4	125 28.8	+15 07.5	29 36.4	−18 34.7	130 24.9	93	+10 32.9	−121
7	285 44.6	241 36.4	18 59.1	359 01.9	07.2	140 31.4	07.6	44 38.9	34.7	144 53.2	94	10 20.8	−121
8	300 47.1	256 36.1	19 00.0	14 02.6	07.1	155 34.1	07.6	59 41.4	34.7	159 21.6	95	10 08.7	−122
9	315 49.5	271 35.9	·· 01.0	29 03.3	·· 07.0	170 36.7	·· 07.7	74 43.9	·· 34.7	173 50.1	95	· 9 56.5	−122
10	330 52.0	286 35.6	01.9	44 04.0	06.8	185 39.4	07.8	89 46.4	34.7	188 18.6	95	9 44.3	−123
11	345 54.5	301 35.4	02.9	59 04.7	06.7	200 42.0	07.8	104 48.9	34.7	202 47.1	96	9 32.0	−124
12	0 56.9	316 35.2	+19 03.8	74 05.4	−23 06.5	215 44.7	+15 07.9	119 51.4	−18 34.7	217 15.7	97	+ 9 19.6	−123
13	15 59.4	331 34.9	04.7	89 06.1	06.4	230 47.3	07.9	134 54.0	34.6	231 44.4	97	9 07.3	−125
14	31 01.9	346 34.7	05.7	104 06.8	06.3	245 50.0	08.0	149 56.5	34.6	246 13.1	97	8 54.8	−125
15	46 04.3	1 34.4	·· 06.6	119 07.5	·· 06.1	260 52.6	·· 08.0	164 59.0	·· 34.6	260 41.8	98	· 8 42.3	−125
16	61 06.8	16 34.2	07.6	134 08.2	06.0	275 55.3	08.1	180 01.5	34.6	275 10.6	98	8 29.8	−126
17	76 09.3	31 33.9	08.5	149 08.9	05.9	290 57.9	08.2	195 04.0	34.6	289 39.4	98	8 17.2	−126
18	91 11.7	46 33.7	+19 09.5	164 09.6	−23 05.7	306 00.6	+15 08.2	210 06.5	−18 34.6	304 08.2	100	+ 8 04.6	−126
19	106 14.2	61 33.4	10.4	179 10.3	05.6	321 03.2	08.3	225 09.0	34.5	318 37.2	99	7 52.0	−127
20	121 16.7	76 33.2	11.3	194 11.0	05.5	336 05.9	08.3	240 11.5	34.5	333 06.1	100	7 39.3	−128
21	136 19.1	91 33.0	·· 12.3	209 11.7	·· 05.3	351 08.5	·· 08.4	255 14.1	·· 34.5	347 35.1	100	· 7 26.5	−128
22	151 21.6	106 32.7	13.2	224 12.4	05.2	6 11.2	08.5	270 16.6	34.5	2 04.1	101	7 13.7	−128
23	166 24.0	121 32.5	14.2	239 13.1	05.0	21 13.8	08.5	285 19.1	34.5	16 33.2	101	7 00.9	−128
24 0	181 26.5	136 32.2	+19 15.1	254 13.8	−23 04.9	36 16.5	+15 08.6	300 21.6	−18 34.5	31 02.3	102	+ 6 48.1	−129
1	196 29.0	151 32.0	16.0	269 14.5	04.8	51 19.1	08.6	315 24.1	34.5	45 31.5	102	6 35.2	−129
2	211 31.4	166 31.7	17.0	284 15.2	04.6	66 21.8	08.7	330 26.6	34.4	60 00.7	102	6 22.3	−130
3	226 33.9	181 31.5	·· 17.9	299 15.9	·· 04.5	81 24.4	·· 08.7	345 29.1	·· 34.4	74 29.9	103	· 6 09.3	−129
4	241 36.4	196 31.2	18.8	314 16.6	04.4	96 27.1	08.8	0 31.7	34.4	88 59.2	103	5 56.4	−131
5	256 38.8	211 31.0	19.8	329 17.3	04.2	111 29.7	08.9	15 34.2	34.4	103 28.5	103	5 43.3	−130
6	271 41.3	226 30.7	+19 20.7	344 18.0	−23 04.1	126 32.4	+15 08.9	30 36.7	−18 34.4	117 57.8	104	+ 5 30.3	−130
7	286 43.8	241 30.5	21.6	359 18.7	03.9	141 35.0	09.0	45 39.2	34.4	132 27.2	104	5 17.3	−131
8	301 46.2	256 30.3	22.6	14 19.4	03.8	156 37.6	09.0	60 41.7	34.3	146 56.6	105	5 04.2	−131
9	316 48.7	271 30.0	·· 23.5	29 20.1	·· 03.7	171 40.3	·· 09.1	75 44.2	·· 34.3	161 26.1	105	· 4 51.1	−131
10	331 51.1	286 29.8	24.4	44 20.8	03.5	186 42.9	09.1	90 46.7	34.3	175 55.6	105	4 38.0	−132
11	346 53.6	301 29.5	25.3	59 21.5	03.4	201 45.6	09.2	105 49.3	34.3	190 25.1	106	4 24.8	−131
12	1 56.1	316 29.3	+19 26.3	74 22.2	−23 03.2	216 48.2	+15 09.3	120 51.8	−18 34.3	204 54.7	105	+ 4 11.7	−132
13	16 58.5	331 29.0	27.2	89 22.9	03.1	231 50.9	09.3	135 54.3	34.3	219 24.2	107	3 58.5	−132
14	32 01.0	346 28.8	28.1	104 23.7	02.9	246 53.5	09.4	150 56.8	34.2	233 53.9	106	3 45.3	−132
15	47 03.5	1 28.5	·· 29.0	119 24.4	·· 02.8	261 56.2	·· 09.4	165 59.3	·· 34.2	248 23.5	107	· 3 32.1	−133
16	62 05.9	16 28.3	30.0	134 25.1	02.7	276 58.8	09.5	181 01.8	34.2	262 53.2	107	3 18.8	−132
17	77 08.4	31 28.0	30.9	149 25.8	02.5	292 01.4	09.5	196 04.4	34.2	277 22.9	107	3 05.6	−132
18	92 10.9	46 27.8	+19 31.8	164 26.5	−23 02.4	307 04.1	+15 09.6	211 06.9	−18 34.2	291 52.6	108	+ 2 52.4	−133
19	107 13.3	61 27.6	32.7	179 27.2	02.2	322 06.7	09.6	226 09.4	34.2	306 22.4	108	2 39.1	−132
20	122 15.8	76 27.3	33.7	194 27.9	02.1	337 09.4	09.7	241 11.9	34.1	320 52.2	108	2 25.9	−133
21	137 18.3	91 27.1	·· 34.6	209 28.6	·· 01.9	352 12.0	·· 09.8	256 14.4	·· 34.1	335 22.0	108	· 2 12.6	−133
22	152 20.7	106 26.8	35.5	224 29.3	01.8	7 14.7	09.8	271 16.9	34.1	349 51.8	109	1 59.3	−133
23	167 23.2	121 26.6	36.4	239 30.0	01.6	22 17.3	09.9	286 19.5	34.1	4 21.7	109	1 46.0	−132
24	182 25.6	136 26.3	+19 37.3	254 30.7	−23 01.5	37 19.9	+15 09.9	301 22.0	−18 34.1	18 51.6	109	+ 1 32.8	−133
code	—	− 3	+ 9	+ 7	+ 1	+ 26	0	+ 26	+ 1				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
22 0	178 14.0	+ 0 32.2	7	Acamar	315 51.1	−40 28.9
1	193 14.2	33.2	5	Achernar	335 59.1	−57 27.6
2	208 14.4	34.2	30	Acrux	173 56.7	−62 51.6
3	223 14.6	·· 35.2	19	Adhara	255 46.2	−28 55.0
4	238 14.7	36.2	10	Aldebaran	291 38.8	+16 25.3
5	253 14.9	37.2				
6	268 15.1	+ 0 38.1	32	Alioth	166 57.7	+56 11.6
7	283 15.3	39.1	34	Alkaid	153 32.1	+49 31.6
8	298 15.5	40.1	55	Al Na'ir	28 37.9	−47 10.3
9	313 15.7	·· 41.1	15	Alnilam	276 29.9	− 1 13.9
10	328 15.9	42.1	25	Alphard	218 38.0	− 8 28.4
11	343 16.1	43.1				
12	358 16.3	+ 0 44.1	41	Alphecca	126 47.1	+26 51.4
13	13 16.4	45.0	1	Alpheratz	358 28.3	+28 50.9
14	28 16.6	46.0	51	Altair	62 50.2	+ 8 45.0
15	43 16.8	·· 47.0	2	Ankaa	353 58.3	−42 32.6
16	58 17.0	48.0	42	Antares	113 18.7	−26 20.2
17	73 17.2	49.0				
18	88 17.4	+ 0 50.0	37	Arcturus	146 34.5	+19 24.3
19	103 17.6	51.0	43	Atria	108 58.9	−68 56.8
20	118 17.8	51.9	22	Avior	234 35.3	−59 22.5
21	133 18.0	·· 52.9	13	Bellatrix	279 18.1	+ 6 18.6
22	148 18.1	53.9	16	Betelg'se	271 47.8	+ 7 23.9
23	163 18.3	54.9				
			17	Canopus	264 15.2	−52 40.6
23 0	178 18.5	+ 0 55.9	12	Capella	281 38.0	+45 57.5
1	193 18.7	56.9	53	Deneb	50 01.0	+45 07.2
2	208 18.9	57.9	28	Denebola	183 17.0	+14 48.8
3	223 19.1	·· 58.8	4	Diphda	349 39.2	−18 13.6
4	238 19.3	0 59.8				
5	253 19.5	1 00.8	27	Dubhe	194 43.5	+61 59.2
6	268 19.7	+ 1 01.8	14	Elnath	279 06.9	+28 34.3
7	283 19.9	02.8	47	Eltanin	91 06.0	+51 29.3
8	298 20.0	03.8	54	Enif	34 29.5	+ 9 40.4
9	313 20.2	·· 04.8	56	Fomalhaut	16 11.5	−29 51.2
10	328 20.4	05.7				
11	343 20.6	06.7	31	Gacrux	172 48.2	−56 52.3
12	358 20.8	+ 1 07.7	29	Gienah	176 36.1	−17 18.2
13	13 21.0	08.7	35	Hadar	149 48.3	−60 09.8
14	28 21.2	09.7	6	Hamal	328 49.5	+23 15.4
15	43 21.4	·· 10.7	48	Kaus Aust.	84 40.7	−34 24.3
16	58 21.6	11.7				
17	73 21.8	12.6	40	Kochab	137 17.1	+74 19.8
18	88 21.9	+ 1 13.6	57	Markab	14 21.4	+14 58.1
19	103 22.1	14.6	8	Menkar	315 00.2	+ 3 55.1
20	118 22.3	15.6	36	Menkent	148 57.9	−36 09.4
21	133 22.5	·· 16.6	24	Miaplacidus	221 48.3	−69 32.6
22	148 22.7	17.6				
23	163 22.9	18.5	9	Mirfak	309 42.2	+49 42.6
			50	Nunki	76 51.5	−26 21.1
24 0	178 23.1	+ 1 19.5	52	Peacock	54 27.0	−56 52.4
1	193 23.3	20.5	21	Pollux	244 20.0	+28 07.9
2	208 23.5	21.5	20	Procyon	245 44.5	+ 5 20.1
3	223 23.7	·· 22.5				
4	238 23.8	23.5	46	Rasalhague	96 46.2	+12 35.3
5	253 24.0	24.4	26	Regulus	208 28.8	+12 10.7
6	268 24.2	+ 1 25.4	11	Rigel	281 53.4	− 8 15.2
7	283 24.4	26.4	38	Rigil Kent.	140 49.9	−60 39.4
8	298 24.6	27.4	44	Sabik	103 01.7	−15 40.4
9	313 24.8	·· 28.4				
10	328 25.0	29.4	3	Schedar	350 30.1	+56 17.9
11	343 25.2	30.3	45	Shaula	97 20.1	−37 04.3
12	358 25.4	+ 1 31.3	18	Sirius	259 11.5	−16 39.6
13	13 25.6	32.3	33	Spica	159 16.2	−10 56.2
14	28 25.8	33.3	23	Suhail	223 23.7	−43 15.7
15	43 25.9	·· 34.3				
16	58 26.1	35.3	49	Vega	81 08.0	+38 44.3
17	73 26.3	36.2	39	Zuben'gubi	137 52.7	−15 51.8
18	88 26.5	+ 1 37.2				
19	103 26.7	38.2				
20	118 26.9	39.2				
21	133 27.1	·· 40.2				
22	148 27.3	41.2				
23	163 27.5	42.1				
24	178 27.7	+ 1 43.1				
code	—	+ 10				

GMT	Equation of Time (App.−Mean) 22	23	24
h	m s	m s	m s
0	− 7 04.4	− 6 46.3	− 6 28.0
6	− 6 59.9	− 6 41.7	− 6 23.5
12	− 6 55.4	− 6 37.2	− 6 18.9
18	− 6 50.8	− 6 32.6	− 6 14.3
24	− 6 46.3	− 6 28.0	− 6 09.7

Lat.	Sunrise	Twlt. begins	Moonrise 22	23	24	25
N °	h m	h m	h m	h m	h m	h m
72	5 43	////	11 19	13 40	15 48	17 52
70	5 45	1 23	11 49	13 55	15 53	17 48
68	5 47	2 09	12 11	14 06	15 57	17 45
66	5 49	2 38	12 28	14 15	16 00	17 43
64	5 50	2 58	12 42	14 23	16 03	17 41
62	5 52	3 15	12 53	14 30	16 05	17 39
60	5 53	3 28	13 03	14 36	16 07	17 37
58	5 54	3 38	13 11	14 41	16 09	17 36
56	5 54	3 47	13 19	14 45	16 10	17 35
54	5 55	3 56	13 26	14 49	16 12	17 33
52	5 56	4 02	13 32	14 53	16 13	17 32
50	5 56	4 08	13 37	14 56	16 14	17 32
45	5 58	4 21	13 48	15 03	16 17	17 30
40	5 59	4 29	13 58	15 09	16 19	17 28
35	6 00	4 36	14 06	15 14	16 21	17 27
30	6 00	4 42	14 13	15 19	16 22	17 25
20	6 02	4 49	14 26	15 26	16 25	17 23
10	6 02	4 53	14 36	15 33	16 28	17 21
0	6 03	4 55	14 47	15 39	16 30	17 20
10	6 04	4 54	14 57	15 46	16 32	17 18
20	6 05	4 51	15 07	15 52	16 35	17 16
30	6 05	4 45	15 19	16 00	16 38	17 14
35	6 06	4 41	15 26	16 04	16 39	17 13
40	6 06	4 35	15 34	16 09	16 41	17 12
45	6 06	4 27	15 43	16 15	16 43	17 11
50	6 07	4 16	15 55	16 22	16 46	17 09
52	6 07	4 11	16 00	16 25	16 47	17 08
54	6 07	4 05	16 05	16 28	16 48	17 07
56	6 07	3 58	16 12	16 32	16 50	17 07
58	6 07	3 50	16 19	16 36	16 51	17 06
60	6 08	3 41	16 26	16 41	16 53	17 04
S						

Lat.	Sunset	Twlt. ends	Moonset 22	23	24	25
N °	h m	h m	h m	h m	h m	h m
72	18 33	////	6 06	5 36	5 16	4 58
70	18 30	23 08	5 34	5 20	5 08	4 58
68	18 28	22 14	5 11	5 06	5 02	4 57
66	18 26	21 43	4 53	4 55	4 57	4 57
64	18 25	21 22	4 38	4 46	4 52	4 57
62	18 23	21 04	4 25	4 38	4 48	4 57
60	18 22	20 51	4 15	4 31	4 45	4 56
58	18 21	20 40	4 05	4 25	4 42	4 56
56	18 20	20 30	3 57	4 20	4 39	4 56
54	18 19	20 22	3 50	4 15	4 36	4 56
52	18 18	20 14	3 43	4 11	4 34	4 56
50	18 18	20 09	3 37	4 06	4 32	4 56
45	18 16	19 56	3 24	3 58	4 28	4 56
40	18 15	19 46	3 13	3 50	4 24	4 55
35	18 14	19 39	3 04	3 44	4 21	4 55
30	18 13	19 33	2 56	3 38	4 18	4 55
20	18 12	19 25	2 42	3 29	4 12	4 55
10	18 11	19 21	2 30	3 20	4 08	4 54
0	18 10	19 19	2 18	3 12	4 04	4 54
10	18 09	19 19	2 06	3 04	3 59	4 53
20	18 08	19 21	1 53	2 55	3 55	4 53
30	18 08	19 28	1 39	2 44	3 49	4 53
35	18 07	19 31	1 30	2 39	3 46	4 52
40	18 07	19 37	1 21	2 32	3 42	4 52
45	18 06	19 44	1 09	2 24	3 38	4 52
50	18 06	19 55	0 55	2 14	3 33	4 51
52	18 05	19 59	0 49	2 10	3 31	4 51
54	18 05	20 05	0 41	2 05	3 28	4 51
56	18 05	20 12	0 33	1 59	3 25	4 50
58	18 05	20 19	0 24	1 53	3 22	4 50
60	18 04	20 28	0 13	1 46	3 19	4 50
S						

GMT of Transit Meridian of Greenwich DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
22	20 59	14 53	7 05	21 40	4 06
23	21 51	14 54	7 04	21 35	4 02
24	22 42	14 54	7 03	21 31	3 58
25	23 31	14 55	7 02	21 27	3 54

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0			
30	0.4	0.2	0.1
45	0.4	0.1	0.1
60	0.4	0.1	0.1
75	0.4	0.1	0.0
90	0.4	0.0	0.0

Moon's Lower Limb Add

Alt.	22	23	24
°	′	′	′
0	18.6	18.5	18.1
4	18.6	18.5	18.1
8	18.6	18.4	18.1
12	18.5	18.4	18.0
16	18.5	18.4	18.0
20	18.4	18.3	18.0
24	18.4	18.2	17.9
28	18.3	18.2	17.8
32	18.2	18.1	17.8
36	18.1	18.0	17.7
40	18.0	17.9	17.6
44	17.9	17.8	17.5
48	17.7	17.7	17.4
52	17.6	17.5	17.3
56	17.5	17.4	17.2
60	17.3	17.3	17.0
64	17.2	17.1	16.9
68	17.0	17.0	16.8
72	16.9	16.8	16.6
76	16.7	16.7	16.5
80	16.5	16.5	16.4
84	16.4	16.3	16.2
88	16.2	16.2	16.1
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	22	23	24
°	′	′	′
0	13.8	13.9	14.1
4	13.8	13.9	14.1
8	13.8	13.9	14.1
12	13.9	13.9	14.2
16	13.9	14.0	14.2
20	14.0	14.0	14.2
24	14.0	14.1	14.3
28	14.1	14.2	14.4
32	14.2	14.3	14.4
36	14.3	14.4	14.5
40	14.4	14.5	14.6
44	14.5	14.6	14.7
48	14.7	14.7	14.8
52	14.8	14.8	14.9
56	14.9	15.0	15.0
60	15.1	15.1	15.2
64	15.2	15.2	15.3
68	15.4	15.4	15.4
72	15.5	15.5	15.5
76	15.7	15.7	15.7
80	15.9	15.9	15.8
84	16.0	16.0	16.0
88	16.2	16.1	16.1
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.8 GHA	VENUS −3.8 Dec.	MARS 0.8 GHA	MARS 0.8 Dec.	JUPITER −2.0 GHA	JUPITER −2.0 Dec.	SATURN 0.5 GHA	SATURN 0.5 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
25 0	182 25.6	136 26.3	+19 37.3	254 30.7	−23 01.5	37 19.9	+15 09.9	301 22.0	−18 34.1	18 51.6	109	+ 1 32.8	−133
1	197 28.1	151 26.1	38.2	269 31.4	01.4	52 22.6	10.0	316 24.5	34.1	33 21.5	110	1 19.5	−133
2	212 30.6	166 25.8	39.2	284 32.1	01.2	67 25.2	10.0	331 27.0	34.1	47 51.5	109	1 06.2	−133
3	227 33.0	181 25.6	·· 40.1	299 32.8	·· 01.1	82 27.9	·· 10.1	346 29.5	·· 34.0	62 21.4	110	· 0 52.9	−132
4	242 35.5	196 25.3	41.0	314 33.5	00.9	97 30.5	10.1	1 32.1	34.0	76 51.4	110	0 39.7	−133
5	257 38.0	211 25.1	41.9	329 34.2	00.8	112 33.1	10.2	16 34.6	34.0	91 21.4	111	0 26.4	−133
6	272 40.4	226 24.9	+19 42.8	344 34.9	−23 00.6	127 35.8	+15 10.3	31 37.1	−18 34.0	105 51.5	110	+ 0 13.1	−132
7	287 42.9	241 24.6	43.7	359 35.6	00.5	142 38.4	10.3	46 39.6	34.0	120 21.5	111	− 0 00.1	−133
8	302 45.4	256 24.4	44.6	14 36.3	00.3	157 41.0	10.4	61 42.1	34.0	134 51.6	111	0 13.4	−132
9	317 47.8	271 24.1	·· 45.6	29 37.0	·· 00.2	172 43.7	·· 10.4	76 44.6	·· 33.9	149 21.7	111	· 0 26.6	−132
10	332 50.3	286 23.9	46.5	44 37.7	23 00.0	187 46.3	10.5	91 47.2	33.9	163 51.8	111	0 39.8	−133
11	347 52.8	301 23.6	47.4	59 38.4	22 59.9	202 49.0	10.5	106 49.7	33.9	178 21.9	111	0 53.1	−132
12	2 55.2	316 23.4	+19 48.3	74 39.1	−22 59.7	217 51.6	+15 10.6	121 52.2	−18 33.9	192 52.0	112	− 1 06.3	−131
13	17 57.7	331 23.1	49.2	89 39.8	59.6	232 54.2	10.6	136 54.7	33.9	207 22.2	112	1 19.4	−132
14	33 00.1	346 22.9	50.1	104 40.5	59.4	247 56.9	10.7	151 57.2	33.9	221 52.4	111	1 32.6	−132
15	48 02.6	1 22.6	·· 51.0	119 41.3	·· 59.3	262 59.5	·· 10.7	166 59.8	·· 33.8	236 22.5	112	· 1 45.8	−131
16	63 05.1	16 22.4	51.9	134 42.0	59.1	278 02.1	10.8	182 02.3	33.8	250 52.7	112	1 58.9	−131
17	78 07.5	31 22.1	52.8	149 42.7	59.0	293 04.8	10.9	197 04.8	33.8	265 22.9	113	2 12.0	−131
18	93 10.0	46 21.9	+19 53.7	164 43.4	−22 58.8	308 07.4	+15 10.9	212 07.3	−18 33.8	279 53.2	112	− 2 25.1	−131
19	108 12.5	61 21.6	54.6	179 44.1	58.7	323 10.0	11.0	227 09.8	33.8	294 23.4	113	2 38.2	−130
20	123 14.9	76 21.4	55.5	194 44.8	58.5	338 12.7	11.0	242 12.4	33.8	308 53.7	112	2 51.2	−131
21	138 17.4	91 21.2	·· 56.4	209 45.5	·· 58.4	353 15.3	·· 11.1	257 14.9	·· 33.7	323 23.9	113	· 3 04.3	−129
22	153 19.9	106 20.9	57.3	224 46.2	58.2	8 18.0	11.1	272 17.4	33.7	337 54.2	113	3 17.2	−130
23	168 22.3	121 20.7	58.2	239 46.9	58.1	23 20.6	11.2	287 19.9	33.7	352 24.5	112	3 30.2	−130
26 0	183 24.8	136 20.4	+19 59.1	254 47.6	−22 57.9	38 23.2	+15 11.2	302 22.5	−18 33.7	6 54.7	113	− 3 43.2	−129
1	198 27.2	151 20.2	20 00.0	269 48.3	57.8	53 25.9	11.3	317 25.0	33.7	21 25.0	113	3 56.1	−129
2	213 29.7	166 19.9	00.9	284 49.0	57.6	68 28.5	11.3	332 27.5	33.6	35 55.3	113	4 09.0	−128
3	228 32.2	181 19.7	·· 01.8	299 49.7	·· 57.5	83 31.1	·· 11.4	347 30.0	·· 33.6	50 25.6	114	· 4 21.8	−128
4	243 34.6	196 19.4	02.7	314 50.4	57.3	98 33.8	11.4	2 32.5	33.6	64 56.0	113	4 34.6	−128
5	258 37.1	211 19.2	03.6	329 51.1	57.2	113 36.4	11.5	17 35.1	33.6	79 26.3	113	4 47.4	−127
6	273 39.6	226 18.9	+20 04.5	344 51.8	−22 57.0	128 39.0	+15 11.5	32 37.6	−18 33.6	93 56.6	113	− 5 00.1	−128
7	288 42.0	241 18.7	05.4	359 52.5	56.8	143 41.6	11.6	47 40.1	33.6	108 26.9	114	5 12.9	−126
8	303 44.5	256 18.4	06.3	14 53.3	56.7	158 44.3	11.6	62 42.6	33.5	122 57.3	113	5 25.5	−127
9	318 47.0	271 18.2	·· 07.2	29 54.0	·· 56.5	173 46.9	·· 11.7	77 45.2	·· 33.5	137 27.6	114	· 5 38.2	−126
10	333 49.4	286 18.0	08.1	44 54.7	56.4	188 49.5	11.7	92 47.7	33.5	151 58.0	113	5 50.8	−125
11	348 51.9	301 17.7	09.0	59 55.4	56.2	203 52.2	11.8	107 50.2	33.5	166 28.3	113	6 03.3	−125
12	3 54.4	316 17.5	+20 09.9	74 56.1	−22 56.1	218 54.8	+15 11.9	122 52.7	−18 33.5	180 58.6	114	− 6 15.8	−125
13	18 56.8	331 17.2	10.8	89 56.8	55.9	233 57.4	11.9	137 55.3	33.5	195 29.0	113	6 28.3	−124
14	33 59.3	346 17.0	11.6	104 57.5	55.8	249 00.1	12.0	152 57.8	33.4	209 59.3	114	6 40.7	−124
15	49 01.7	1 16.7	·· 12.5	119 58.2	·· 55.6	264 02.7	·· 12.0	168 00.3	·· 33.4	224 29.7	113	· 6 53.1	−123
16	64 04.2	16 16.5	13.4	134 58.9	55.4	279 05.3	12.1	183 02.8	33.4	239 00.0	114	7 05.4	−123
17	79 06.7	31 16.2	14.3	149 59.6	55.3	294 07.9	12.1	198 05.4	33.4	253 30.4	113	7 17.7	−122
18	94 09.1	46 16.0	+20 15.2	165 00.3	−22 55.1	309 10.6	+15 12.2	213 07.9	−18 33.4	268 00.7	114	− 7 29.9	−122
19	109 11.6	61 15.7	16.1	180 01.0	55.0	324 13.2	12.2	228 10.4	33.4	282 31.1	113	7 42.1	−121
20	124 14.1	76 15.5	17.0	195 01.7	54.8	339 15.8	12.3	243 12.9	33.3	297 01.4	114	7 54.2	−121
21	139 16.5	91 15.2	·· 17.8	210 02.5	·· 54.7	354 18.5	·· 12.3	258 15.5	·· 33.3	311 31.8	113	· 8 06.3	−120
22	154 19.0	106 15.0	18.7	225 03.2	54.5	9 21.1	12.4	273 18.0	33.3	326 02.1	113	8 18.3	−120
23	169 21.5	121 14.7	19.6	240 03.9	54.3	24 23.7	12.4	288 20.5	33.3	340 32.4	114	8 30.3	−119
27 0	184 23.9	136 14.5	+20 20.5	255 04.6	−22 54.2	39 26.3	+15 12.5	303 23.0	−18 33.3	355 02.8	113	− 8 42.2	−119
1	199 26.4	151 14.3	21.4	270 05.3	54.0	54 29.0	12.5	318 25.6	33.2	9 33.1	113	8 54.1	−118
2	214 28.9	166 14.0	22.2	285 06.0	53.9	69 31.6	12.6	333 28.1	33.2	24 03.4	113	9 05.9	−117
3	229 31.3	181 13.8	·· 23.1	300 06.7	·· 53.7	84 34.2	·· 12.6	348 30.6	·· 33.2	38 33.7	113	· 9 17.6	−117
4	244 33.8	196 13.5	24.0	315 07.4	53.5	99 36.8	12.7	3 33.1	33.2	53 04.0	113	9 29.3	−116
5	259 36.2	211 13.3	24.9	330 08.1	53.4	114 39.5	12.7	18 35.7	33.2	67 34.3	113	9 40.9	−116
6	274 38.7	226 13.0	+20 25.7	345 08.8	−22 53.2	129 42.1	+15 12.8	33 38.2	−18 33.2	82 04.6	113	− 9 52.5	−115
7	289 41.2	241 12.8	26.6	0 09.5	53.1	144 44.7	12.8	48 40.7	33.1	96 34.9	113	10 04.0	−114
8	304 43.6	256 12.5	27.5	15 10.2	52.9	159 47.3	12.9	63 43.3	33.1	111 05.2	113	10 15.4	−114
9	319 46.1	271 12.3	·· 28.4	30 11.0	·· 52.7	174 50.0	·· 12.9	78 45.8	·· 33.1	125 35.5	113	·10 26.8	−113
10	334 48.6	286 12.0	29.2	45 11.7	52.6	189 52.6	13.0	93 48.3	33.1	140 05.8	112	10 38.1	−113
11	349 51.0	301 11.8	30.1	60 12.4	52.4	204 55.2	13.0	108 50.8	33.1	154 36.0	113	10 49.4	−111
12	4 53.5	316 11.5	+20 31.0	75 13.1	−22 52.3	219 57.8	+15 13.1	123 53.4	−18 33.0	169 06.3	112	−11 00.5	−111
13	19 56.0	331 11.3	31.9	90 13.8	52.1	235 00.5	13.1	138 55.9	33.0	183 36.5	112	11 11.6	−111
14	34 58.4	346 11.0	32.7	105 14.5	51.9	250 03.1	13.2	153 58.4	33.0	198 06.7	113	11 22.7	−109
15	50 00.9	1 10.8	·· 33.6	120 15.2	·· 51.8	265 05.7	·· 13.2	169 00.9	·· 33.0	212 37.0	112	·11 33.6	−109
16	65 03.3	16 10.6	34.5	135 15.9	51.6	280 08.3	13.3	184 03.5	33.0	227 07.2	112	11 44.5	−109
17	80 05.8	31 10.3	35.3	150 16.6	51.4	295 11.0	13.3	199 06.0	33.0	241 37.4	112	11 55.4	−107
18	95 08.3	46 10.1	+20 36.2	165 17.3	−22 51.3	310 13.6	+15 13.4	214 08.5	−18 32.9	256 07.6	112	−12 06.1	−107
19	110 10.7	61 09.8	37.1	180 18.1	51.1	325 16.2	13.4	229 11.1	32.9	270 37.8	111	12 16.8	−106
20	125 13.2	76 09.6	37.9	195 18.8	50.9	340 18.8	13.5	244 13.6	32.9	285 07.9	112	12 27.4	−105
21	140 15.7	91 09.3	·· 38.8	210 19.5	·· 50.8	355 21.4	·· 13.5	259 16.1	·· 32.9	299 38.1	112	·12 37.9	−105
22	155 18.1	106 09.1	39.6	225 20.2	50.6	10 24.1	13.5	274 18.7	32.9	314 08.3	111	12 48.4	−104
23	170 20.6	121 08.8	40.5	240 20.9	50.4	25 26.7	13.6	289 21.2	32.8	328 38.4	111	12 58.8	−103
24	185 23.1	136 08.6	+20 41.4	255 21.6	−22 50.3	40 29.3	+15 13.6	304 23.7	−18 32.8	343 08.5	111	−13 09.1	−102
code	—	− 3	+ 9	+ 7	+ 2	+ 26	0	+ 26	0				

G M T	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
25 0	178 27.7	+ 1 43.1	7	Acamar	315 51.2	−40 28.9
1	193 27.9	44.1	5	Achernar	335 59.1	−57 27.6
2	208 28.0	45.1	30	Acrux	173 56.7	−62 51.6
3	223 28.2	·· 46.1	19	Adhara	255 46.2	−28 55.0
4	238 28.4	47.1	10	Aldebaran	291 38.8	+16 25.3
5	253 28.6	48.0				
6	268 28.8	+ 1 49.0	32	Alioth	166 57.7	+56 11.6
7	283 29.0	50.0	34	Alkaid	153 32.1	+49 31.6
8	298 29.2	51.0	55	Al Na'ir	28 37.8	−47 10.3
9	313 29.4	·· 52.0	15	Alnilam	276 30.0	− 1 13.9
10	328 29.6	52.9	25	Alphard	218 38.0	− 8 28.4
11	343 29.8	53.9				
12	358 30.0	+ 1 54.9	41	Alphecca	126 47.1	+26 51.4
13	13 30.1	55.9	1	Alpheratz	358 28.3	+28 50.9
14	28 30.3	56.9	51	Altair	62 50.2	+ 8 45.0
15	43 30.5	·· 57.9	2	Ankaa	353 58.3	−42 32.6
16	58 30.7	58.8	42	Antares	113 18.7	−26 20.2
17	73 30.9	1 59.8				
18	88 31.1	+ 2 00.8	37	Arcturus	146 34.5	+19 24.3
19	103 31.3	01.8	43	Atria	108 58.9	−68 56.8
20	118 31.5	02.8	22	Avior	234 35.3	−59 22.5
21	133 31.7	·· 03.7	13	Bellatrix	279 18.1	+ 6 18.6
22	148 31.9	04.7	16	Betelg'se	271 47.8	+ 7 23.9
23	163 32.1	05.7				
			17	Canopus	264 15.2	−52 40.6
26 0	178 32.2	+ 2 06.7	12	Capella	281 38.0	+45 57.4
1	193 32.4	07.7	53	Deneb	50 01.0	+45 07.2
2	208 32.6	08.6	28	Denebola	183 17.0	+14 48.8
3	223 32.8	·· 09.6	4	Diphda	349 39.2	−18 13.6
4	238 33.0	10.6				
5	253 33.2	11.6	27	Dubhe	194 43.5	+61 59.2
6	268 33.4	+ 2 12.6	14	Elnath	279 06.9	+28 34.3
7	283 33.6	13.6	47	Eltanin	91 06.0	+51 29.3
8	298 33.8	14.5	54	Enif	34 29.5	+ 9 40.4
9	313 34.0	·· 15.5	56	Fomalhaut	16 11.5	−29 51.2
10	328 34.2	16.5				
11	343 34.3	17.5	31	Gacrux	172 48.2	−56 52.3
12	358 34.5	+ 2 18.5	29	Gienah	176 36.1	−17 18.2
13	13 34.7	19.4	35	Hadar	149 48.3	−60 09.8
14	28 34.9	20.4	6	Hamal	328 49.5	+23 15.4
15	43 35.1	·· 21.4	48	Kaus Aust.	84 40.7	−34 24.3
16	58 35.3	22.4				
17	73 35.5	23.3	40	Kochab	137 17.0	+74 19.8
18	88 35.7	+ 2 24.3	57	Markab	14 21.4	+14 58.1
19	103 35.9	25.3	8	Menkar	315 00.2	+ 3 55.1
20	118 36.1	26.3	36	Menkent	148 57.9	−36 09.4
21	133 36.3	·· 27.3	24	Miapl'dus	221 48.3	−69 32.6
22	148 36.5	28.2				
23	163 36.6	29.2	9	Mirfak	309 42.2	+49 42.5
			50	Nunki	76 51.5	−26 21.1
27 0	178 36.8	+ 2 30.2	52	Peacock	54 27.0	−56 52.4
1	193 37.0	31.2	21	Pollux	244 20.0	+28 08.0
2	208 37.2	32.2	20	Procyon	245 44.5	+ 5 20.1
3	223 37.4	·· 33.1				
4	238 37.6	34.1	46	R'alhague	96 46.2	+12 35.3
5	253 37.8	35.1	26	Regulus	208 28.8	+12 10.7
6	268 38.0	+ 2 36.1	11	Rigel	281 53.4	− 8 15.2
7	283 38.2	37.1	38	Rigil Kent.	140 49.9	−60 39.4
8	298 38.4	38.0	44	Sabik	103 01.6	−15 40.4
9	313 38.6	·· 39.0				
10	328 38.7	40.0	3	Schedar	350 30.1	+56 17.9
11	343 38.9	41.0	45	Shaula	97 20.1	−37 04.3
12	358 39.1	+ 2 41.9	18	Sirius	259 11.5	−16 39.6
13	13 39.3	42.9	33	Spica	159 16.2	−10 56.2
14	28 39.5	43.9	23	Suhail	223 23.8	−43 15.7
15	43 39.7	·· 44.9				
16	58 39.9	45.9	49	Vega	81 08.0	+38 44.3
17	73 40.1	46.8	39	Zub'g'bi	137 52.7	−15 51.8
18	88 40.3	+ 2 47.8				
19	103 40.5	48.8				
20	118 40.7	49.8				
21	133 40.9	·· 50.7				
22	148 41.0	51.7				
23	163 41.2	52.7				
24	178 41.4	+ 2 53.7				
code	—	+ 9				

Lat.	Sunrise	Twlt. begins	Moonrise 25	26	27	28
N °	h m	h m	h m	h m	h m	h m
72	5 27	////	17 52	19 55	22 04	24 40
70	5 31	////	17 48	19 42	21 38	23 42
68	5 35	1 42	17 45	19 32	21 19	23 08
66	5 37	2 18	17 43	19 24	21 04	22 44
64	5 40	2 42	17 41	19 17	20 52	22 25
62	5 42	3 01	17 39	19 11	20 41	22 09
60	5 44	3 16	17 37	19 06	20 33	21 57
58	5 45	3 28	17 36	19 01	20 25	21 46
56	5 46	3 38	17 35	18 57	20 18	21 36
54	5 48	3 46	17 33	18 53	20 12	21 28
52	5 49	3 54	17 32	18 50	20 07	21 20
50	5 50	4 01	17 32	18 47	20 02	21 13
45	5 52	4 14	17 30	18 41	19 51	20 59
40	5 54	4 24	17 28	18 36	19 42	20 47
35	5 55	4 32	17 27	18 31	19 35	20 37
30	5 57	4 38	17 25	18 27	19 28	20 28
20	5 59	4 46	17 23	18 20	19 17	20 13
10	6 01	4 51	17 21	18 14	19 07	20 00
0	6 02	4 54	17 20	18 09	18 58	19 48
10	6 04	4 54	17 18	18 03	18 49	19 35
20	6 05	4 52	17 16	17 58	18 39	19 22
30	6 07	4 47	17 14	17 51	18 28	19 08
35	6 08	4 43	17 13	17 47	18 22	18 59
40	6 09	4 38	17 12	17 43	18 15	18 50
45	6 10	4 31	17 11	17 38	18 07	18 38
50	6 11	4 22	17 09	17 32	17 57	18 25
52	6 12	4 16	17 08	17 30	17 53	18 19
54	6 12	4 12	17 07	17 27	17 48	18 12
56	6 13	4 05	17 07	17 24	17 42	18 04
58	6 14	3 58	17 06	17 20	17 36	17 55
60	6 15	3 49	17 04	17 16	17 29	17 45
S						

Lat.	Sunset	Twlt. ends	Moonset 25	26	27	28
N °	h m	h m	h m	h m	h m	h m
72	18 47	////	4 58	4 41	4 22	3 56
70	18 42	////	4 58	4 47	4 36	4 23
68	18 39	22 43	4 57	4 53	4 48	4 44
66	18 36	22 03	4 57	4 57	4 58	5 00
64	18 33	21 36	4 57	5 01	5 07	5 13
62	18 31	21 17	4 57	5 05	5 14	5 25
60	18 29	21 01	4 56	5 08	5 20	5 34
58	18 28	20 49	4 56	5 10	5 26	5 43
56	18 26	20 38	4 56	5 13	5 31	5 50
54	18 25	20 29	4 56	5 15	5 35	5 57
52	18 24	20 22	4 56	5 17	5 39	6 03
50	18 23	20 15	4 56	5 19	5 43	6 09
45	18 20	20 00	4 56	5 23	5 51	6 21
40	18 18	19 50	4 55	5 26	5 57	6 31
35	18 17	19 42	4 55	5 29	6 03	6 39
30	18 15	19 35	4 55	5 31	6 08	6 47
20	18 13	19 27	4 55	5 36	6 17	7 00
10	18 11	19 21	4 54	5 39	6 25	7 11
0	18 09	19 18	4 54	5 43	6 32	7 22
10	18 07	19 17	4 53	5 47	6 40	7 32
20	18 06	19 19	4 53	5 51	6 47	7 44
30	18 04	19 23	4 53	5 55	6 56	7 57
35	18 03	19 27	4 52	5 57	7 02	8 05
40	18 02	19 32	4 52	6 00	7 08	8 13
45	18 01	19 39	4 52	6 04	7 14	8 24
50	17 59	19 47	4 51	6 08	7 23	8 36
52	17 59	19 52	4 51	6 10	7 27	8 42
54	17 58	19 57	4 51	6 12	7 31	8 48
56	17 57	20 03	4 50	6 14	7 36	8 55
58	17 56	20 09	4 50	6 16	7 41	9 03
60	17 55	20 17	4 50	6 19	7 47	9 13
S						

G M T	Equation of Time (App. − Mean) 25	26	27
h	m s	m s	m s
0	− 6 09.7	− 5 51.4	− 5 33.1
6	− 6 05.2	− 5 46.8	− 5 28.5
12	− 6 00.6	− 5 42.2	− 5 23.9
18	− 5 56.0	− 5 37.6	− 5 19.3
24	− 5 51.4	− 5 33.1	− 5 14.7

GMT of Transit Meridian of Greenwich					
DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
25	23 31	14 55	7 02	21 27	3 54
26	24 21	14 55	7 01	21 23	3 50
27	0 21	14 55	6 59	21 19	3 46
28	1 10	14 56	6 58	21 14	3 42

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.4	0.2	0.1
30	0.4	0.1	0.1
45	0.4	0.1	0.1
60	0.4	0.1	0.0
75	0.4	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	25	26	27
°	′	′	′
0	17.6	16.9	16.2
4	17.6	16.9	16.2
8	17.6	16.9	16.2
12	17.5	16.9	16.2
16	17.5	16.9	16.2
20	17.5	16.9	16.2
24	17.4	16.8	16.1
28	17.4	16.8	16.1
32	17.3	16.8	16.1
36	17.2	16.7	16.1
40	17.2	16.7	16.1
44	17.1	16.6	16.0
48	17.0	16.6	16.0
52	16.9	16.5	16.0
56	16.8	16.4	16.0
60	16.7	16.4	15.9
64	16.6	16.3	15.9
68	16.5	16.2	15.9
72	16.4	16.2	15.8
76	16.3	16.1	15.8
80	16.2	16.0	15.8
84	16.1	15.9	15.7
88	16.0	15.9	15.7
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	25	26	27
°	′	′	′
0	14.4	14.8	15.2
4	14.4	14.8	15.2
8	14.4	14.8	15.2
12	14.4	14.8	15.2
16	14.5	14.8	15.2
20	14.5	14.8	15.2
24	14.5	14.9	15.2
28	14.6	14.9	15.3
32	14.7	14.9	15.3
36	14.7	15.0	15.3
40	14.8	15.0	15.3
44	14.9	15.1	15.3
48	15.0	15.1	15.4
52	15.0	15.2	15.4
56	15.1	15.3	15.4
60	15.2	15.3	15.5
64	15.3	15.4	15.5
68	15.4	15.5	15.5
72	15.5	15.5	15.5
76	15.7	15.6	15.6
80	15.8	15.7	15.6
84	15.9	15.8	15.7
88	16.0	15.8	15.7
90			

Subtract from table, back cover

Palm Sunday	25
Full Moon	26
First Day of Passover	27

GMT	♈ GHA	VENUS −3.9 GHA	VENUS −3.9 Dec.	MARS 0.8 GHA	MARS 0.8 Dec.	JUPITER −2.0 GHA	JUPITER −2.0 Dec.	SATURN 0.5 GHA	SATURN 0.5 Dec	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
28 0	185 23.1	136 08.6	+20 41.4	255 21.6	−22 50.3	40 29.3	+15 13.6	304 23.7	−18 32.8	343 08.5	111	−13 09.1	−102
1	200 25.5	151 08.3	42.2	270 22.3	50.1	55 31.9	13.7	319 26.2	32.8	357 38.6	112	13 19.3	−101
2	215 28.0	166 08.1	43.1	285 23.0	49.9	70 34.5	13.7	334 28.8	32.8	12 08.8	110	13 29.4	−101
3	230 30.5	181 07.8	·· 43.9	300 23.7	·· 49.8	85 37.2	·· 13.8	349 31.3	·· 32.8	26 38.8	111	·13 39.5	−100
4	245 32.9	196 07.6	44.8	315 24.5	49.6	100 39.8	13.8	4 33.8	32.8	41 08.9	111	13 49.5	− 99
5	260 35.4	211 07.4	45.7	330 25.2	49.4	115 42.4	13.9	19 36.4	32.7	55 39.0	111	13 59.4	− 98
6	275 37.8	226 07.1	+20 46.5	345 25.9	−22 49.3	130 45.0	+15 13.9	34 38.9	−18 32.7	70 09.1	110	−14 09.2	− 97
7	290 40.3	241 06.9	47.4	0 26.6	49.1	145 47.6	14.0	49 41.4	32.7	84 39.1	110	14 18.9	− 97
8	305 42.8	256 06.6	48.2	15 27.3	48.9	160 50.3	14.0	64 44.0	32.7	99 09.1	111	14 28.6	− 95
9	320 45.2	271 06.4	·· 49.1	30 28.0	·· 48.8	175 52.9	·· 14.1	79 46.5	·· 32.7	113 39.2	110	·14 38.1	− 95
10	335 47.7	286 06.1	49.9	45 28.7	48.6	190 55.5	14.1	94 49.0	32.6	128 09.2	110	14 47.6	− 94
11	350 50.2	301 05.9	50.8	60 29.4	48.4	205 58.1	14.2	109 51.6	32.6	142 39.2	109	14 57.0	− 93
12	5 52.6	316 05.6	+20 51.6	75 30.1	−22 48.3	221 00.7	+15 14.2	124 54.1	−18 32.6	157 09.1	110	−15 06.3	− 92
13	20 55.1	331 05.4	52.5	90 30.9	48.1	236 03.3	14.3	139 56.6	32.6	171 39.1	110	15 15.5	− 92
14	35 57.6	346 05.1	53.3	105 31.6	47.9	251 06.0	14.3	154 59.2	32.6	186 09.1	109	15 24.7	− 90
15	51 00.0	1 04.9	·· 54.2	120 32.3	·· 47.8	266 08.6	·· 14.4	170 01.7	·· 32.5	200 39.0	110	·15 33.7	− 89
16	66 02.5	16 04.6	55.0	135 33.0	47.6	281 11.2	14.4	185 04.2	32.5	215 09.0	109	15 42.6	− 89
17	81 05.0	31 04.4	55.9	150 33.7	47.4	296 13.8	14.4	200 06.8	32.5	229 38.9	109	15 51.5	− 88
18	96 07.4	46 04.2	+20 56.7	165 34.4	−22 47.2	311 16.4	+15 14.5	215 09.3	−18 32.5	244 08.8	109	−16 00.3	− 87
19	111 09.9	61 03.9	57.6	180 35.1	47.1	326 19.0	14.5	230 11.8	32.5	258 38.7	109	16 09.0	− 85
20	126 12.3	76 03.7	58.4	195 35.8	46.9	341 21.6	14.6	245 14.4	32.4	273 08.6	108	16 17.5	− 85
21	141 14.8	91 03.4	·20 59.3	210 36.6	·· 46.7	356 24.3	·· 14.6	260 16.9	·· 32.4	287 38.4	109	·16 26.0	− 84
22	156 17.3	106 03.2	21 00.1	225 37.3	46.6	11 26.9	14.7	275 19.4	32.4	302 08.3	108	16 34.4	− 84
23	171 19.7	121 02.9	00.9	240 38.0	46.4	26 29.5	14.7	290 22.0	32.4	316 38.1	109	16 42.8	− 82
29 0	186 22.2	136 02.7	+21 01.8	255 38.7	−22 46.2	41 32.1	+15 14.8	305 24.5	−18 32.4	331 08.0	108	−16 51.0	− 81
1	201 24.7	151 02.4	02.6	270 39.4	46.0	56 34.7	14.8	320 27.0	32.4	345 37.8	108	16 59.1	− 80
2	216 27.1	166 02.2	03.5	285 40.1	45.9	71 37.3	14.9	335 29.6	32.3	0 07.6	108	17 07.1	− 79
3	231 29.6	181 01.9	·· 04.3	300 40.8	·· 45.7	86 39.9	·· 14.9	350 32.1	·· 32.3	14 37.4	108	·17 15.0	− 79
4	246 32.1	196 01.7	05.1	315 41.6	45.5	101 42.5	14.9	5 34.6	32.3	29 07.2	107	17 22.9	− 77
5	261 34.5	211 01.4	06.0	330 42.3	45.3	116 45.2	15.0	20 37.2	32.3	43 36.9	108	17 30.6	− 76
6	276 37.0	226 01.2	+21 06.8	345 43.0	−22 45.2	131 47.8	+15 15.0	35 39.7	−18 32.3	58 06.7	108	−17 38.2	− 76
7	291 39.4	241 01.0	07.7	0 43.7	45.0	146 50.4	15.1	50 42.2	32.2	72 36.5	107	17 45.8	− 74
8	306 41.9	256 00.7	08.5	15 44.4	44.8	161 53.0	15.1	65 44.8	32.2	87 06.2	107	17 53.2	− 73
9	321 44.4	271 00.5	·· 09.3	30 45.1	·· 44.6	176 55.6	·· 15.2	80 47.3	·· 32.2	101 35.9	107	·18 00.5	− 73
10	336 46.8	286 00.2	10.2	45 45.8	44.5	191 58.2	15.2	95 49.8	32.2	116 05.6	108	18 07.8	− 71
11	351 49.3	301 00.0	11.0	60 46.6	44.3	207 00.8	15.3	110 52.4	32.2	130 35.4	107	18 14.9	− 71
12	6 51.8	315 59.7	+21 11.8	75 47.3	−22 44.1	222 03.4	+15 15.3	125 54.9	−18 32.1	145 05.1	106	−18 22.0	− 69
13	21 54.2	330 59.5	12.7	90 48.0	43.9	237 06.0	15.3	140 57.4	32.1	159 34.7	107	18 28.9	− 68
14	36 56.7	345 59.2	13.5	105 48.7	43.8	252 08.6	15.4	156 00.0	32.1	174 04.4	107	18 35.7	− 68
15	51 59.2	0 59.0	·· 14.3	120 49.4	·· 43.6	267 11.3	·· 15.4	171 02.5	·· 32.1	188 34.1	107	·18 42.5	− 66
16	67 01.6	15 58.7	15.1	135 50.1	43.4	282 13.9	15.5	186 05.1	32.1	203 03.8	106	18 49.1	− 65
17	82 04.1	30 58.5	16.0	150 50.8	43.2	297 16.5	15.5	201 07.6	32.0	217 33.4	107	18 55.6	− 64
18	97 06.6	45 58.3	+21 16.8	165 51.6	−22 43.0	312 19.1	+15 15.6	216 10.1	−18 32.0	232 03.1	106	−19 02.0	− 64
19	112 09.0	60 58.0	17.6	180 52.3	42.9	327 21.7	15.6	231 12.7	32.0	246 32.7	106	19 08.4	− 62
20	127 11.5	75 57.8	18.4	195 53.0	42.7	342 24.3	15.7	246 15.2	32.0	261 02.3	107	19 14.6	− 61
21	142 13.9	90 57.5	·· 19.3	210 53.7	·· 42.5	357 26.9	·· 15.7	261 17.7	·· 32.0	275 32.0	106	·19 20.7	− 60
22	157 16.4	105 57.3	20.1	225 54.4	42.3	12 29.5	15.7	276 20.3	31.9	290 01.6	106	19 26.7	− 59
23	172 18.9	120 57.0	20.9	240 55.1	42.2	27 32.1	15.8	291 22.8	31.9	304 31.2	106	19 32.6	− 58
30 0	187 21.3	135 56.8	+21 21.7	255 55.9	−22 42.0	42 34.7	+15 15.8	306 25.4	−18 31.9	319 00.8	106	−19 38.4	− 57
1	202 23.8	150 56.5	22.6	270 56.6	41.8	57 37.3	15.9	321 27.9	31.9	333 30.4	106	19 44.1	− 56
2	217 26.3	165 56.3	23.4	285 57.3	41.6	72 39.9	15.9	336 30.4	31.9	348 00.0	106	19 49.7	− 55
3	232 28.7	180 56.0	·· 24.2	300 58.0	·· 41.4	87 42.5	·· 16.0	351 33.0	·· 31.8	2 29.6	105	·19 55.2	− 53
4	247 31.2	195 55.8	25.0	315 58.7	41.3	102 45.1	16.0	6 35.5	31.8	16 59.1	106	20 00.5	− 53
5	262 33.7	210 55.6	25.8	330 59.4	41.1	117 47.7	16.0	21 38.0	31.8	31 28.7	106	20 05.8	− 52
6	277 36.1	225 55.3	+21 26.6	346 00.2	−22 40.9	132 50.3	+15 16.1	36 40.6	−18 31.8	45 58.3	106	−20 11.0	− 50
7	292 38.6	240 55.1	27.5	1 00.9	40.7	147 53.0	16.1	51 43.1	31.8	60 27.9	105	20 16.0	− 50
8	307 41.1	255 54.8	28.3	16 01.6	40.5	162 55.6	16.2	66 45.7	31.7	74 57.4	106	20 21.0	− 48
9	322 43.5	270 54.6	·· 29.1	31 02.3	·· 40.3	177 58.2	·· 16.2	81 48.2	·· 31.7	89 27.0	106	·20 25.8	− 47
10	337 46.0	285 54.3	29.9	46 03.0	40.2	193 00.8	16.3	96 50.7	31.7	103 56.6	105	20 30.5	− 47
11	352 48.4	300 54.1	30.7	61 03.7	40.0	208 03.4	16.3	111 53.3	31.7	118 26.1	106	20 35.2	− 45
12	7 50.9	315 53.8	+21 31.5	76 04.5	−22 39.8	223 06.0	+15 16.3	126 55.8	−18 31.7	132 55.7	106	−20 39.7	− 44
13	22 53.4	330 53.6	32.3	91 05.2	39.6	238 08.6	16.4	141 58.4	31.6	147 25.3	105	20 44.1	− 43
14	37 55.8	345 53.4	33.1	106 05.9	39.4	253 11.2	16.4	157 00.9	31.6	161 54.8	106	20 48.4	− 42
15	52 58.3	0 53.1	·· 33.9	121 06.6	·· 39.2	268 13.8	·· 16.5	172 03.4	·· 31.6	176 24.4	105	·20 52.6	− 40
16	68 00.8	15 52.9	34.8	136 07.3	39.1	283 16.4	16.5	187 06.0	31.6	190 53.9	106	20 56.6	− 40
17	83 03.2	30 52.6	35.6	151 08.0	38.9	298 19.0	16.5	202 08.5	31.6	205 23.5	106	21 00.6	− 39
18	98 05.7	45 52.4	+21 36.4	166 08.8	−22 38.7	313 21.6	+15 16.6	217 11.1	−18 31.5	219 53.1	105	−21 04.5	− 37
19	113 08.2	60 52.1	37.2	181 09.5	38.5	328 24.2	16.6	232 13.6	31.5	234 22.6	106	21 08.2	− 37
20	128 10.6	75 51.9	38.0	196 10.2	38.3	343 26.8	16.7	247 16.2	31.5	248 52.2	106	21 11.9	− 35
21	143 13.1	90 51.6	·· 38.8	211 10.9	·· 38.1	358 29.4	·· 16.7	262 18.7	·· 31.5	263 21.8	105	·21 15.4	− 34
22	158 15.5	105 51.4	39.6	226 11.6	38.0	13 32.0	16.7	277 21.2	31.5	277 51.3	106	21 18.8	− 33
23	173 18.0	120 51.2	40.4	241 12.4	37.8	28 34.6	16.8	292 23.8	31.4	292 20.9	106	21 22.1	− 32
24	188 20.5	135 50.9	+21 41.2	256 13.1	−22 37.6	43 37.2	+15 16.8	307 26.3	−18 31.4	306 50.5	106	−21 25.3	− 31
code	—	− 2	+ 9	+ 7	+ 2	+ 26	0	+ 25	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
28 0	178 41.4	+ 2 53.7	7	Acamar	315 51.2	−40 28.9
1	193 41.6	54.6	5	Achernar	335 59.1	−57 27.6
2	208 41.8	55.6	30	Acrux	173 56.7	−62 51.6
3	223 42.0	·· 56.6	19	Adhara	255 46.2	−28 55.0
4	238 42.2	57.6	10	Aldebaran	291 38.8	+16 25.3
5	253 42.4	58.5				
6	268 42.6	+ 2 59.5	32	Alioth	166 57.6	+56 11.6
7	283 42.8	3 00.5	34	Alkaid	153 32.1	+49 31.6
8	298 43.0	01.5	55	Al Na'ir	28 37.8	−47 10.3
9	313 43.1	·· 02.5	15	Alnilam	276 30.0	− 1 13.9
10	328 43.3	03.4	25	Alphard	218 38.0	− 8 28.4
11	343 43.5	04.4				
12	358 43.7	+ 3 05.4	41	Alphecca	126 47.1	+26 51.4
13	13 43.9	06.4	1	Alpheratz	358 28.3	+28 50.9
14	28 44.1	07.3	51	Altair	62 50.1	+ 8 45.0
15	43 44.3	·· 08.3	2	Ankaa	353 58.3	−42 32.6
16	58 44.5	09.3	42	Antares	113 18.7	−26 20.2
17	73 44.7	10.3				
18	88 44.9	+ 3 11.2	37	Arcturus	146 34.5	+19 24.3
19	103 45.1	12.2	43	Atria	108 58.8	−68 56.8
20	118 45.2	13.2	22	Avior	234 35.3	−59 22.5
21	133 45.4	·· 14.2	13	Bellatrix	279 18.1	+ 6 18.6
22	148 45.6	15.1	16	Betelg'se	271 47.8	+ 7 23.9
23	163 45.8	16.1				
			17	Canopus	264 15.2	−52 40.6
29 0	178 46.0	+ 3 17.1	12	Capella	281 38.0	+45 57.4
1	193 46.2	18.0	53	Deneb	50 00.9	+45 07.2
2	208 46.4	19.0	28	Denebola	183 17.0	+14 48.8
3	223 46.6	·· 20.0	4	Diphda	349 39.2	−18 13.6
4	238 46.8	21.0				
5	253 47.0	21.9	27	Dubhe	194 43.5	+61 59.2
6	268 47.1	+ 3 22.9	14	Elnath	279 07.0	+28 34.3
7	283 47.3	23.9	47	Eltanin	91 06.0	+51 29.3
8	298 47.5	24.9	54	Enif	34 29.4	+ 9 40.4
9	313 47.7	·· 25.8	56	Fomalhaut	16 11.5	−29 51.2
10	328 47.9	26.8				
11	343 48.1	27.8	31	Gacrux	172 48.2	−56 52.3
12	358 48.3	+ 3 28.8	29	Gienah	176 36.1	−17 18.2
13	13 48.5	29.7	35	Hadar	149 48.3	−60 09.8
14	28 48.7	30.7	6	Hamal	328 49.5	+23 15.4
15	43 48.9	·· 31.7	48	Kaus Aust.	84 40.6	−34 24.3
16	58 49.0	32.6				
17	73 49.2	33.6	40	Kochab	137 17.0	+74 19.8
18	88 49.4	+ 3 34.6	57	Markab	14 21.4	+14 58.1
19	103 49.6	35.6	8	Menkar	315 00.2	+ 3 55.1
20	118 49.8	36.5	36	Menkent	148 57.8	−36 09.4
21	133 50.0	·· 37.5	24	Miapl'dus	221 48.4	−69 32.6
22	148 50.2	38.5				
23	163 50.4	39.5	9	Mirfak	309 42.2	+49 42.5
			50	Nunki	76 51.4	−26 21.1
30 0	178 50.6	+ 3 40.4	52	Peacock	54 26.9	−56 52.4
1	193 50.8	41.4	21	Pollux	244 20.0	+28 08.0
2	208 50.9	42.4	20	Procyon	245 44.5	+ 5 20.1
3	223 51.1	·· 43.3				
4	238 51.3	44.3	46	R'alhague	96 46.2	+12 35.3
5	253 51.5	45.3	26	Regulus	208 28.9	+12 10.7
6	268 51.7	+ 3 46.2	11	Rigel	281 53.4	− 8 15.2
7	283 51.9	47.2	38	Rigil Kent.	140 49.9	−60 39.4
8	298 52.1	48.2	44	Sabik	103 01.6	−15 40.4
9	313 52.3	·· 49.2				
10	328 52.5	50.1	3	Schedar	350 30.1	+56 17.9
11	343 52.7	51.1	45	Shaula	97 20.0	−37 04.3
12	358 52.8	+ 3 52.1	18	Sirius	259 11.5	−16 39.6
13	13 53.0	53.0	33	Spica	159 16.2	−10 56.2
14	28 53.2	54.0	23	Suhail	223 23.8	−43 15.7
15	43 53.4	·· 55.0				
16	58 53.6	55.9	49	Vega	81 08.0	+38 44.3
17	73 53.8	56.9	39	Zub'g'bi	137 52.7	−15 51.8
18	88 54.0	+ 3 57.9				
19	103 54.2	58.9				
20	118 54.4	3 59.8				
21	133 54.5	· 4 00.8				
22	148 54.7	01.8				
23	163 54.9	02.7				
24	178 55.1	+ 4 03.7				
code	—	+ 9				

GMT	Equation of Time (App. −Mean) 28	29	30
h	m s	m s	m s
0	− 5 14.7	− 4 56.4	− 4 38.1
6	− 5 10.1	− 4 51.8	− 4 33.5
12	− 5 05.5	− 4 47.2	− 4 29.0
18	− 5 00.9	− 4 42.7	− 4 24.5
24	− 4 56.4	− 4 38.1	− 4 19.9

Lat. N °	Sunrise h m	Twlt. begins h m
72	5 12	////
70	5 17	////
68	5 22	1 04
66	5 26	1 56
64	5 29	2 25
62	5 32	2 46
60	5 34	3 03
58	5 37	3 16
56	5 39	3 28
54	5 40	3 38
52	5 42	3 45
50	5 43	3 53
45	5 46	4 07
40	5 49	4 19
35	5 51	4 27
30	5 53	4 33
20	5 56	4 43
10	5 59	4 50
0	6 02	4 53
10	6 04	4 54
20	6 06	4 53
30	6 09	4 49
35	6 10	4 45
40	6 12	4 41
45	6 14	4 34
50	6 16	4 26
52	6 17	4 22
54	6 18	4 17
56	6 19	4 12
58	6 20	4 06
60	6 22	3 58
S		

Moonrise	28	29	30	31
Lat. N °	h m	h m	h m	h m
72	24 40	0 40	▬	▬
70	23 42	▬	▬	▬
68	23 08	24 59	0 59	2 57
66	22 44	24 20	0 20	1 48
64	22 25	23 53	25 12	1 12
62	22 09	23 32	24 46	0 46
60	21 57	23 16	24 26	0 26
58	21 46	23 01	24 10	0 10
56	21 36	22 49	23 56	24 52
54	21 28	22 39	23 44	24 40
52	21 20	22 30	23 33	24 29
50	21 13	22 21	23 24	24 19
45	20 59	22 03	23 04	23 58
40	20 47	21 49	22 48	23 41
35	20 37	21 37	22 34	23 27
30	20 28	21 26	22 22	23 14
20	20 13	21 08	22 02	22 53
10	20 00	20 52	21 44	22 35
0	19 48	20 38	21 28	22 18
10	19 35	20 23	21 12	22 01
20	19 22	20 07	20 54	21 43
30	19 08	19 50	20 34	21 22
35	18 59	19 39	20 23	21 10
40	18 50	19 27	20 10	20 56
45	18 38	19 14	19 54	20 39
50	18 25	18 57	19 35	20 19
52	18 19	18 49	19 25	20 09
54	18 12	18 40	19 15	19 58
56	18 04	18 30	19 04	19 45
58	17 55	18 19	18 50	19 31
60	17 45	18 06	18 35	19 14

Lat. N °	Sunset h m	Twlt. ends h m
72	19 01	////
70	18 55	////
68	18 50	23 27
66	18 46	22 25
64	18 42	21 52
62	18 39	21 30
60	18 37	21 13
58	18 34	20 58
56	18 32	20 46
54	18 30	20 36
52	18 29	20 28
50	18 27	20 20
45	18 24	20 05
40	18 21	19 53
35	18 19	19 45
30	18 17	19 38
20	18 14	19 28
10	18 11	19 21
0	18 08	19 17
10	18 06	19 16
20	18 03	19 16
30	18 00	19 19
35	17 59	19 23
40	17 57	19 27
45	17 55	19 33
50	17 53	19 41
52	17 52	19 45
54	17 51	19 49
56	17 49	19 54
58	17 48	20 00
60	17 46	20 07

Moonset	28	29	30	31
Lat. N °	h m	h m	h m	h m
72	3 56	3 04	▬	▬
70	4 23	4 04	▬	▬
68	4 44	4 38	4 32	4 19
66	5 00	5 03	5 11	5 28
64	5 13	5 23	5 39	6 04
62	5 25	5 39	6 00	6 30
60	5 34	5 53	6 17	6 51
58	5 43	6 04	6 32	7 07
56	5 50	6 14	6 44	7 21
54	5 57	6 23	6 55	7 34
52	6 03	6 31	7 05	7 45
50	6 09	6 39	7 13	7 54
45	6 21	6 54	7 32	8 14
40	6 31	7 07	7 47	8 31
35	6 39	7 18	7 59	8 45
30	6 47	7 27	8 11	8 57
20	7 00	7 44	8 30	9 17
10	7 11	7 58	8 46	9 35
0	7 22	8 11	9 02	9 52
10	7 32	8 25	9 17	10 09
20	7 44	8 40	9 34	10 27
30	7 57	8 56	9 53	10 48
35	8 05	9 06	10 05	11 00
40	8 13	9 17	10 18	11 14
45	8 24	9 30	10 33	11 30
50	8 36	9 46	10 52	11 51
52	8 42	9 54	11 00	12 00
54	8 48	10 02	11 10	12 11
56	8 55	10 11	11 22	12 23
58	9 03	10 22	11 35	12 38
60	9 13	10 34	11 50	12 55

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
28	1 10	14 56	6 58	21 14	3 42
29	2 00	14 56	6 57	21 10	3 38
30	2 50	14 57	6 56	21 06	3 34
31	3 40	14 57	6 55	21 02	3 30

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.3	0.2	0.1
30	0.3	0.1	0.1
45	0.3	0.1	0.1
60	0.3	0.1	0.0
75	0.3	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	28	29	30
°	′	′	′
0	15.3	14.4	13.6
4	15.3	14.4	13.7
8	15.3	14.4	13.7
12	15.3	14.4	13.7
16	15.3	14.4	13.7
20	15.3	14.5	13.8
24	15.3	14.5	13.8
28	15.3	14.5	13.8
32	15.3	14.6	13.9
36	15.3	14.6	14.0
40	15.3	14.6	14.0
44	15.4	14.7	14.1
48	15.4	14.7	14.2
52	15.4	14.8	14.3
56	15.4	14.8	14.3
60	15.4	14.9	14.4
64	15.4	14.9	14.5
68	15.4	15.0	14.6
72	15.4	15.1	14.7
76	15.5	15.1	14.8
80	15.5	15.2	14.9
84	15.5	15.2	15.0
88	15.5	15.3	15.1
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	28	29	30
°	′	′	′
0	15.7	16.2	16.6
4	15.7	16.2	16.6
8	15.7	16.2	16.6
12	15.7	16.2	16.6
16	15.7	16.2	16.6
20	15.7	16.1	16.5
24	15.7	16.1	16.5
28	15.7	16.1	16.4
32	15.7	16.1	16.4
36	15.7	16.0	16.3
40	15.6	16.0	16.3
44	15.6	15.9	16.2
48	15.6	15.9	16.1
52	15.6	15.8	16.0
56	15.6	15.8	15.9
60	15.6	15.7	15.8
64	15.6	15.7	15.8
68	15.6	15.6	15.7
72	15.6	15.6	15.6
76	15.5	15.5	15.5
80	15.5	15.4	15.4
84	15.5	15.4	15.2
88	15.5	15.3	15.2
90			

Subtract from table, back cover

Good Friday 30

GMT	♈ GHA	VENUS −3.9 GHA	Dec	MARS 0.8 GHA	Dec	JUPITER −1.9 GHA	Dec	SATURN 0.5 GHA	Dec	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
31 0	188 20.5	135 50.9	+21 41.2	256 13.1	−22 37.6	43 37.2	+15 16.8	307 26.3	−18 31.4	306 50.5	106	−21 25.3	− 31
1	203 22.9	150 50.7	42.0	271 13.8	37.4	58 39.8	16.9	322 28.9	31.4	321 20.1	106	21 28.4	− 30
2	218 25.4	165 50.4	42.8	286 14.5	37.2	73 42.4	16.9	337 31.4	31.4	335 49.7	106	21 31.4	− 29
3	233 27.9	180 50.2	·· 43.6	301 15.2	·· 37.0	88 45.0	·· 16.9	352 33.9	·· 31.4	350 19.3	106	·21 34.3	− 27
4	248 30.3	195 49.9	44.4	316 15.9	36.8	103 47.6	17.0	7 36.5	31.3	4 48.9	106	21 37.0	− 27
5	263 32.8	210 49.7	45.2	331 16.7	36.6	118 50.2	17.0	22 39.0	31.3	19 18.5	107	21 39.7	− 25
6	278 35.3	225 49.5	+21 46.0	346 17.4	−22 36.5	133 52.8	+15 17.1	37 41.6	−18 31.3	33 48.2	106	−21 42.2	− 25
7	293 37.7	240 49.2	46.8	1 18.1	36.3	148 55.4	17.1	52 44.1	31.3	48 17.8	106	21 44.7	− 23
8	308 40.2	255 49.0	47.6	16 18.8	36.1	163 57.9	17.1	67 46.7	31.3	62 47.4	107	21 47.0	− 22
9	323 42.7	270 48.7	·· 48.4	31 19.5	·· 35.9	179 00.5	·· 17.2	82 49.2	·· 31.2	77 17.1	107	·21 49.2	− 21
10	338 45.1	285 48.5	49.2	46 20.3	35.7	194 03.1	17.2	97 51.7	31.2	91 46.8	106	21 51.3	− 20
11	353 47.6	300 48.2	49.9	61 21.0	35.5	209 05.7	17.3	112 54.3	31.2	106 16.4	107	21 53.3	− 19
12	8 50.0	315 48.0	+21 50.7	76 21.7	−22 35.3	224 08.3	+15 17.3	127 56.8	−18 31.2	120 46.1	107	−21 55.2	− 17
13	23 52.5	330 47.7	51.5	91 22.4	35.1	239 10.9	17.3	142 59.4	31.1	135 15.8	107	21 56.9	− 17
14	38 55.0	345 47.5	52.3	106 23.1	34.9	254 13.5	17.4	158 01.9	31.1	149 45.5	107	21 58.6	− 15
15	53 57.4	0 47.3	·· 53.1	121 23.9	·· 34.8	269 16.1	·· 17.4	173 04.5	·· 31.1	164 15.2	108	·22 00.1	− 15
16	68 59.9	15 47.0	53.9	136 24.6	34.6	284 18.7	17.5	188 07.0	31.1	178 45.0	107	22 01.6	− 13
17	84 02.4	30 46.8	54.7	151 25.3	34.4	299 21.3	17.5	203 09.6	31.1	193 14.7	108	22 02.9	− 12
18	99 04.8	45 46.5	+21 55.5	166 26.0	−22 34.2	314 23.9	+15 17.5	218 12.1	−18 31.0	207 44.5	108	−22 04.1	− 12
19	114 07.3	60 46.3	56.2	181 26.8	34.0	329 26.5	17.6	233 14.6	31.0	222 14.3	108	22 05.3	− 10
20	129 09.8	75 46.1	57.0	196 27.5	33.8	344 29.1	17.6	248 17.2	31.0	236 44.1	108	22 06.3	− 9
21	144 12.2	90 45.8	·· 57.8	211 28.2	·· 33.6	359 31.7	·· 17.7	263 19.7	·· 31.0	251 13.9	108	·22 07.2	− 8
22	159 14.7	105 45.6	58.6	226 28.9	33.4	14 34.3	17.7	278 22.3	31.0	265 43.7	108	22 08.0	− 6
23	174 17.1	120 45.3	21 59.4	241 29.6	33.2	29 36.9	17.7	293 24.8	30.9	280 13.5	109	22 08.6	− 6
1 0	189 19.6	135 45.1	+22 00.2	256 30.4	−22 33.0	44 39.4	+15 17.8	308 27.4	−18 30.9	294 43.4	109	−22 09.2	− 5
1	204 22.1	150 44.8	00.9	271 31.1	32.8	59 42.0	17.8	323 29.9	30.9	309 13.3	109	22 09.7	− 3
2	219 24.5	165 44.6	01.7	286 31.8	32.6	74 44.6	17.8	338 32.5	30.9	323 43.2	109	22 10.0	− 3
3	234 27.0	180 44.4	·· 02.5	301 32.5	·· 32.5	89 47.2	·· 17.9	353 35.0	·· 30.9	338 13.1	109	·22 10.3	− 1
4	249 29.5	195 44.1	03.3	316 33.2	32.3	104 49.8	17.9	8 37.6	30.8	352 43.0	110	22 10.4	0
5	264 31.9	210 43.9	04.0	331 34.0	32.1	119 52.4	18.0	23 40.1	30.8	7 13.0	109	22 10.4	0
6	279 34.4	225 43.6	+22 04.8	346 34.7	−22 31.9	134 55.0	+15 18.0	38 42.7	−18 30.8	21 42.9	110	−22 10.4	+ 2
7	294 36.9	240 43.4	05.6	1 35.4	31.7	149 57.6	18.0	53 45.2	30.8	36 12.9	110	22 10.2	+ 3
8	309 39.3	255 43.1	06.4	16 36.1	31.5	165 00.2	18.1	68 47.8	30.7	50 42.9	111	22 09.9	+ 4
9	324 41.8	270 42.9	·· 07.1	31 36.9	·· 31.3	180 02.8	·· 18.1	83 50.3	·· 30.7	65 13.0	111	·22 09.5	+ 5
10	339 44.3	285 42.7	07.9	46 37.6	31.1	195 05.3	18.1	98 52.8	30.7	79 43.1	110	22 09.0	+ 6
11	354 46.7	300 42.4	08.7	61 38.3	30.9	210 07.9	18.2	113 55.4	30.7	94 13.1	111	22 08.4	+ 8
12	9 49.2	315 42.2	+22 09.5	76 39.0	−22 30.7	225 10.5	+15 18.2	128 57.9	−18 30.7	108 43.2	112	−22 07.6	+ 8
13	24 51.6	330 41.9	10.2	91 39.8	30.5	240 13.1	18.3	144 00.5	30.6	123 13.4	111	22 06.8	+ 9
14	39 54.1	345 41.7	11.0	106 40.5	30.3	255 15.7	18.3	159 03.0	30.6	137 43.5	112	22 05.9	+ 10
15	54 56.6	0 41.5	·· 11.8	121 41.2	·· 30.1	270 18.3	·· 18.3	174 05.6	·· 30.6	152 13.7	112	·22 04.9	+ 12
16	69 59.0	15 41.2	12.5	136 41.9	29.9	285 20.9	18.4	189 08.1	30.6	166 43.9	112	22 03.7	+ 12
17	85 01.5	30 41.0	13.3	151 42.6	29.7	300 23.5	18.4	204 10.7	30.6	181 14.1	113	22 02.5	+ 14
18	100 04.0	45 40.7	+22 14.1	166 43.4	−22 29.5	315 26.0	+15 18.4	219 13.2	−18 30.5	195 44.4	113	−22 01.1	+ 14
19	115 06.4	60 40.5	14.8	181 44.1	29.3	330 28.6	18.5	234 15.8	30.5	210 14.7	113	21 59.7	+ 16
20	130 08.9	75 40.3	15.6	196 44.8	29.1	345 31.2	18.5	249 18.3	30.5	224 45.0	113	21 58.1	+ 17
21	145 11.4	90 40.0	·· 16.3	211 45.5	·· 28.9	0 33.8	·· 18.5	264 20.9	·· 30.5	239 15.3	114	·21 56.4	+ 17
22	160 13.8	105 39.8	17.1	226 46.3	28.7	15 36.4	18.6	279 23.4	30.4	253 45.7	114	21 54.7	+ 19
23	175 16.3	120 39.5	17.9	241 47.0	28.5	30 39.0	18.6	294 26.0	30.4	268 16.1	114	21 52.8	+ 20
2 0	190 18.8	135 39.3	+22 18.6	256 47.7	−22 28.3	45 41.6	+15 18.6	309 28.5	−18 30.4	282 46.5	114	−21 50.8	+ 20
1	205 21.2	150 39.1	19.4	271 48.4	28.1	60 44.1	18.7	324 31.1	30.4	297 16.9	115	21 48.8	+ 22
2	220 23.7	165 38.8	20.1	286 49.2	27.9	75 46.7	18.7	339 33.6	30.4	311 47.4	115	21 46.6	+ 23
3	235 26.1	180 38.6	·· 20.9	301 49.9	·· 27.7	90 49.3	·· 18.8	354 36.2	·· 30.3	326 17.9	115	·21 44.3	+ 24
4	250 28.6	195 38.3	21.7	316 50.6	27.5	105 51.9	18.8	9 38.7	30.3	340 48.4	116	21 41.9	+ 24
5	265 31.1	210 38.1	22.4	331 51.3	27.3	120 54.5	18.8	24 41.3	30.3	355 19.0	116	21 39.5	+ 26
6	280 33.5	225 37.9	+22 23.2	346 52.1	−22 27.1	135 57.1	+15 18.9	39 43.8	−18 30.3	9 49.6	116	−21 36.9	+ 27
7	295 36.0	240 37.6	23.9	1 52.8	26.9	150 59.6	18.9	54 46.4	30.2	24 20.2	117	21 34.2	+ 28
8	310 38.5	255 37.4	24.7	16 53.5	26.7	166 02.2	18.9	69 48.9	30.2	38 50.9	117	21 31.4	+ 29
9	325 40.9	270 37.1	·· 25.4	31 54.2	·· 26.5	181 04.8	·· 19.0	84 51.5	·· 30.2	53 21.6	117	·21 28.5	+ 29
10	340 43.4	285 36.9	26.2	46 55.0	26.3	196 07.4	19.0	99 54.0	30.2	67 52.3	117	21 25.6	+ 31
11	355 45.9	300 36.7	26.9	61 55.7	26.1	211 10.0	19.0	114 56.6	30.2	82 23.0	118	21 22.5	+ 32
12	10 48.3	315 36.4	+22 27.7	76 56.4	−22 25.9	226 12.5	+15 19.1	129 59.1	−18 30.1	96 53.8	118	−21 19.3	+ 33
13	25 50.8	330 36.2	28.4	91 57.1	25.7	241 15.1	19.1	145 01.7	30.1	111 24.6	118	21 16.0	+ 33
14	40 53.2	345 36.0	29.2	106 57.9	25.5	256 17.7	19.1	160 04.3	30.1	125 55.4	119	21 12.7	+ 35
15	55 55.7	0 35.7	·· 29.9	121 58.6	·· 25.3	271 20.3	·· 19.2	175 06.8	·· 30.1	140 26.3	119	·21 09.2	+ 36
16	70 58.2	15 35.5	30.7	136 59.3	25.1	286 22.9	19.2	190 09.4	30.0	154 57.2	120	21 05.6	+ 36
17	86 00.6	30 35.2	31.4	152 00.0	24.9	301 25.4	19.2	205 11.9	30.0	169 28.2	119	21 02.0	+ 38
18	101 03.1	45 35.0	+22 32.2	167 00.8	−22 24.7	316 28.0	+15 19.3	220 14.5	−18 30.0	183 59.1	120	−20 58.2	+ 38
19	116 05.6	60 34.8	32.9	182 01.5	24.5	331 30.6	19.3	235 17.0	30.0	198 30.1	121	20 54.4	+ 40
20	131 08.0	75 34.5	33.6	197 02.2	24.3	346 33.2	19.3	250 19.6	30.0	213 01.2	120	20 50.4	+ 40
21	146 10.5	90 34.3	·· 34.4	212 03.0	·· 24.1	1 35.8	·· 19.4	265 22.1	·· 29.9	227 32.2	121	·20 46.4	+ 42
22	161 13.0	105 34.1	35.1	227 03.7	23.9	16 38.3	19.4	280 24.7	29.9	242 03.3	122	20 42.2	+ 42
23	176 15.4	120 33.8	35.9	242 04.4	23.7	31 40.9	19.4	295 27.2	29.9	256 34.5	121	20 38.0	+ 43
24	191 17.9	135 33.6	+22 36.6	257 05.1	−22 23.5	46 43.5	+15 19.5	310 29.8	−18 29.9	271 05.6	122	−20 33.7	+ 45
code	−	− 3	+ 7	+ 8	+ 2	+ 26	+ 1	+ 26	+ 1				

G M T	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
31 0	178 55.1	+ 4 03.7	7	Acamar	315 51.2	−40 28.9
1	193 55.3	04.7	5	Achernar	335 59.1	−57 27.5
2	208 55.5	05.6	30	Acrux	173 56.7	−62 51.6
3	223 55.7	·· 06.6	19	Adhara	255 46.2	−28 55.0
4	238 55.9	07.6	10	Aldebaran	291 38.8	+16 25.3
5	253 56.1	08.5				
6	268 56.3	+ 4 09.5	32	Alioth	166 57.6	+56 11.7
7	283 56.4	10.5	34	Alkaid	153 32.1	+49 31.7
8	298 56.6	11.4	55	Al Na'ir	28 37.8	−47 10.2
9	313 56.8	·· 12.4	15	Alnilam	276 30.0	− 1 13.9
10	328 57.0	13.4	25	Alphard	218 38.0	− 8 28.4
11	343 57.2	14.3				
12	358 57.4	+ 4 15.3	41	Alphecca	126 47.0	+26 51.4
13	13 57.6	16.3	1	Alpheratz	358 28.3	+28 50.9
14	28 57.8	17.2	51	Altair	62 50.1	+ 8 45.0
15	43 57.9	·· 18.2	2	Ankaa	353 58.3	−42 32.6
16	58 58.1	19.2	42	Antares	113 18.7	−26 20.2
17	73 58.3	20.1				
18	88 58.5	+ 4 21.1	37	Arcturus	146 34.5	+19 24.3
19	103 58.7	22.1	43	Atria	108 58.8	−68 56.8
20	118 58.9	23.0	22	Avior	234 35.4	−59 22.5
21	133 59.1	·· 24.0	13	Bellatrix	279 18.1	+ 6 18.6
22	148 59.3	25.0	16	Betelg'se	271 47.8	+ 7 23.9
23	163 59.5	25.9				
			17	Canopus	264 15.3	−52 40.6
1 0	178 59.6	+ 4 26.9	12	Capella	281 38.0	+45 57.4
1	193 59.8	27.9	53	Deneb	50 00.9	+45 07.2
2	209 00.0	28.8	28	Denebola	183 17.0	+14 48.8
3	224 00.2	·· 29.8	4	Diphda	349 39.2	−18 13.6
4	239 00.4	30.8				
5	254 00.6	31.7	27	Dubhe	194 43.5	+61 59.2
6	269 00.8	+ 4 32.7	14	Elnath	279 07.0	+28 34.3
7	284 01.0	33.7	47	Eltanin	91 05.9	+51 29.3
8	299 01.1	34.6	54	Enif	34 29.4	+ 9 40.4
9	314 01.3	·· 35.6	56	Fomalhaut	16 11.5	−29 51.2
10	329 01.5	36.6				
11	344 01.7	37.5	31	Gacrux	172 48.2	−56 52.3
12	359 01.9	+ 4 38.5	29	Gienah	176 36.1	−17 18.2
13	14 02.1	39.4	35	Hadar	149 48.2	−60 09.8
14	29 02.3	40.4	6	Hamal	328 49.5	+23 15.4
15	44 02.5	·· 41.4	48	Kaus Aust.	84 40.6	−34 24.3
16	59 02.6	42.3				
17	74 02.8	43.3	40	Kochab	137 17.0	+74 19.8
18	89 03.0	+ 4 44.3	57	Markab	14 21.3	+14 58.1
19	104 03.2	45.2	8	Menkar	315 00.2	+ 3 55.1
20	119 03.4	46.2	36	Menkent	148 57.8	−36 09.5
21	134 03.6	·· 47.1	24	Miapl'dus	221 48.4	−69 32.6
22	149 03.8	48.1				
23	164 03.9	49.1	9	Mirfak	309 42.2	+49 42.5
			50	Nunki	76 51.4	−26 21.1
2 0	179 04.1	+ 4 50.0	52	Peacock	54 26.9	−56 52.4
2 1	194 04.3	51.0	21	Pollux	244 20.0	+28 08.0
2	209 04.5	52.0	20	Procyon	245 44.5	+ 5 20.1
3	224 04.7	·· 52.9				
4	239 04.9	53.9	46	R'alhague	96 46.1	+12 35.3
5	254 05.1	54.8	26	Regulus	208 28.9	+12 10.7
6	269 05.3	+ 4 55.8	11	Rigel	281 53.4	− 8 15.2
7	284 05.4	56.8	38	Rigil Kent.	140 49.8	−60 39.4
8	299 05.6	57.7	44	Sabik	103 01.6	−15 40.4
9	314 05.8	·· 58.7				
10	329 06.0	4 59.6	3	Schedar	350 30.1	+56 17.9
11	344 06.2	5 00.6	45	Shaula	97 20.0	−37 04.3
12	359 06.4	+ 5 01.6	18	Sirius	259 11.5	−16 39.6
13	14 06.6	02.5	33	Spica	159 16.2	−10 56.2
14	29 06.7	03.5	23	Suhail	223 23.8	−43 15.7
15	44 06.9	·· 04.4				
16	59 07.1	05.4	49	Vega	81 08.0	+38 44.3
17	74 07.3	06.4	39	Zub'g'bi	137 52.6	−15 51.8
18	89 07.5	+ 5 07.3				
19	104 07.7	08.3				
20	119 07.9	09.2				
21	134 08.0	·· 10.2				
22	149 08.2	11.2				
23	164 08.4	12.1				
24	179 08.6	+ 5 13.1				
de	—	+ 9				

Lat.	Sunrise	Twlt. begins	Moonrise 31	1	2	3
N °	h m	h m	h m	h m	h m	h m
72	4 56	////	▬	▬	▬	▬
70	5 03	////	▬	▬	▬	▬
68	5 09	////	2 57	▬	4 43	4 30
66	5 14	1 28	1 48	2 54	3 32	3 49
64	5 19	2 06	1 12	2 14	2 56	3 21
62	5 22	2 30	0 46	1 46	2 30	2 59
60	5 25	2 50	0 26	1 25	2 09	2 42
58	5 28	3 05	0 10	1 07	1 53	2 27
56	5 31	3 17	24 52	0 52	1 38	2 15
54	5 33	3 28	24 40	0 40	1 26	2 04
52	5 35	3 37	24 29	0 29	1 15	1 54
50	5 37	3 45	24 19	0 19	1 06	1 45
45	5 41	4 01	23 58	24 45	0 45	1 27
40	5 44	4 13	23 41	24 29	0 29	1 12
35	5 47	4 22	23 27	24 15	0 15	0 59
30	5 50	4 30	23 14	24 03	0 03	0 48
20	5 54	4 41	22 53	23 42	24 28	0 28
10	5 57	4 48	22 35	23 24	24 12	0 12
0	6 01	4 52	22 18	23 08	23 56	24 43
10	6 04	4 54	22 01	22 51	23 40	24 29
20	6 07	4 54	21 43	22 33	23 24	24 14
30	6 11	4 51	21 22	22 12	23 04	23 57
35	6 13	4 48	21 10	22 00	22 53	23 47
40	6 15	4 44	20 56	21 46	22 40	23 36
45	6 17	4 38	20 39	21 30	22 24	23 23
50	6 21	4 31	20 19	21 09	22 06	23 06
52	6 22	4 27	20 09	21 00	21 57	22 59
54	6 23	4 24	19 58	20 49	21 47	22 50
56	6 25	4 19	19 45	20 36	21 35	22 40
58	6 27	4 13	19 31	20 22	21 22	22 29
60 S	6 29	4 07	19 14	20 05	21 07	22 17

Lat.	Sunset	Twlt. ends	Moonset 31	1	2	3
N °	h m	h m	h m	h m	h m	h m
72	19 15	////	▬	▬	▬	▬
70	19 07	////	▬	▬	▬	▬
68	19 01	////	4 19	▬	6 00	7 53
66	18 55	22 53	5 28	6 06	7 10	8 33
64	18 51	22 11	6 04	6 46	7 47	9 01
62	18 47	21 44	6 30	7 14	8 12	9 22
60	18 44	21 24	6 51	7 36	8 33	9 39
58	18 41	21 08	7 07	7 53	8 49	9 53
56	18 38	20 55	7 21	8 08	9 03	10 05
54	18 36	20 44	7 34	8 21	9 15	10 16
52	18 34	20 35	7 45	8 32	9 26	10 26
50	18 32	20 27	7 54	8 42	9 35	10 34
45	18 28	20 10	8 14	9 02	9 55	10 52
40	18 24	19 57	8 31	9 19	10 11	11 07
35	18 21	19 47	8 45	9 33	10 25	11 19
30	18 19	19 40	8 57	9 46	10 37	11 30
20	18 14	19 28	9 17	10 07	10 57	11 48
10	18 11	19 21	9 35	10 25	11 15	12 04
0	18 07	19 16	9 52	10 42	11 31	12 19
10	18 04	19 14	10 09	10 59	11 47	12 34
20	18 00	19 13	10 27	11 17	12 05	12 49
30	17 57	19 16	10 48	11 38	12 25	13 07
35	17 55	19 19	11 00	11 50	12 36	13 18
40	17 52	19 22	11 14	12 04	12 50	13 30
45	17 49	19 27	11 30	12 21	13 06	13 44
50	17 46	19 34	11 51	12 42	13 25	14 01
52	17 45	19 37	12 00	12 51	13 34	14 09
54	17 43	19 41	12 11	13 02	13 44	14 18
56	17 41	19 45	12 23	13 15	13 56	14 28
58	17 40	19 51	12 38	13 29	14 09	14 39
60 S	17 37	19 57	12 55	13 46	14 25	14 52

G M T	Equation of Time (App. − Mean) 31	1	2
h	m s	m s	m s
0	− 4 19.9	− 4 01.8	− 3 43.8
6	− 4 15.4	− 3 57.3	− 3 39.4
12	− 4 10.8	− 3 52.8	− 3 34.9
18	− 4 06.3	− 3 48.3	− 3 30.4
24	− 4 01.8	− 3 43.8	− 3 26.0

GMT of Transit Meridian of Greenwich DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
31	3 40	14 57	6 55	21 02	3 30
1	4 30	14 57	6 54	20 58	3 26
2	5 19	14 58	6 53	20 54	3 22
3	6 07	14 58	6 51	20 50	3 18

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.3	0.2	0.1
30	0.3	0.1	0.1
45	0.3	0.1	0.1
60	0.3	0.1	0.0
75	0.3	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	31	1	2
°	′	′	′
0	13.0	12.5	12.1
4	13.0	12.5	12.1
8	13.0	12.5	12.2
12	13.1	12.6	12.2
16	13.1	12.6	12.2
20	13.2	12.7	12.3
24	13.2	12.7	12.4
28	13.3	12.8	12.5
32	13.3	12.9	12.6
36	13.4	13.0	12.7
40	13.5	13.1	12.8
44	13.6	13.2	12.9
48	13.7	13.4	13.1
52	13.8	13.5	13.2
56	13.9	13.6	13.4
60	14.1	13.8	13.5
64	14.2	13.9	13.7
68	14.3	14.1	13.9
72	14.5	14.2	14.1
76	14.6	14.4	14.3
80	14.7	14.6	14.4
84	14.9	14.7	14.6
88	15.0	14.9	14.8
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	31	1	2
°	′	′	′
0	17.0	17.3	17.5
4	17.0	17.3	17.5
8	17.0	17.3	17.5
12	16.9	17.2	17.4
16	16.9	17.2	17.4
20	16.9	17.1	17.3
24	16.8	17.1	17.2
28	16.7	17.0	17.2
32	16.7	16.9	17.1
36	16.6	16.8	16.9
40	16.5	16.7	16.8
44	16.4	16.6	16.7
48	16.3	16.4	16.6
52	16.2	16.3	16.4
56	16.1	16.2	16.2
60	15.9	16.0	16.1
64	15.8	15.9	15.9
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.3	15.2	15.2
84	15.1	15.1	15.0
88	15.0	14.9	14.9
90			

Subtract from table, back cover

Easter Sunday 1

GMT	♈ GHA	VENUS −3.9 GHA	Dec.	MARS 0.7 GHA	Dec.	JUPITER −1.9 GHA	Dec.	SATURN 0.5 GHA	Dec	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
3 00	191 17.9	135 33.6	+22 36.6	257 05.1	−22 23.5	46 43.5	+15 19.5	310 29.8	−18 29.9	271 05.6	122	−20 33.7	+ 45
01	206 20.4	150 33.3	37.3	272 05.9	23.3	61 46.1	19.5	325 32.3	29.8	285 36.8	123	20 29.2	+ 45
02	221 22.8	165 33.1	38.1	287 06.6	23.0	76 48.6	19.5	340 34.9	29.8	300 08.1	122	20 24.7	+ 46
03	236 25.3	180 32.9	·· 38.8	302 07.3	·· 22.8	91 51.2	·· 19.6	355 37.4	·· 29.8	314 39.3	123	·20 20.1	+ 47
04	251 27.7	195 32.6	39.5	317 08.1	22.6	106 53.8	19.6	10 40.0	29.8	329 10.6	124	20 15.4	+ 48
05	266 30.2	210 32.4	40.3	332 08.8	22.4	121 56.4	19.6	25 42.6	29.8	343 42.0	124	20 10.6	+ 48
06	281 32.7	225 32.2	+22 41.0	347 09.5	−22 22.2	136 58.9	+15 19.7	40 45.1	−18 29.7	358 13.4	124	−20 05.8	+ 50
07	296 35.1	240 31.9	41.7	2 10.2	22.0	152 01.5	19.7	55 47.7	29.7	12 44.8	124	20 00.8	+ 51
08	311 37.6	255 31.7	42.5	17 11.0	21.8	167 04.1	19.7	70 50.2	29.7	27 16.2	125	19 55.7	+ 51
09	326 40.1	270 31.5	·· 43.2	32 11.7	·· 21.6	182 06.7	·· 19.8	85 52.8	·· 29.7	41 47.7	125	·19 50.6	+ 52
10	341 42.5	285 31.2	43.9	47 12.4	21.4	197 09.2	19.8	100 55.3	29.6	56 19.2	125	19 45.4	+ 54
11	356 45.0	300 31.0	44.7	62 13.2	21.2	212 11.8	19.8	115 57.9	29.6	70 50.7	126	19 40.0	+ 54
12	11 47.5	315 30.8	+22 45.4	77 13.9	−22 21.0	227 14.4	+15 19.8	131 00.4	−18 29.6	85 22.3	126	−19 34.6	+ 55
13	26 49.9	330 30.5	46.1	92 14.6	20.8	242 17.0	19.9	146 03.0	29.6	99 53.9	126	19 29.1	+ 56
14	41 52.4	345 30.3	46.8	107 15.3	20.6	257 19.5	19.9	161 05.6	29.5	114 25.5	127	19 23.5	+ 56
15	56 54.9	0 30.0	·· 47.6	122 16.1	·· 20.3	272 22.1	·· 19.9	176 08.1	·· 29.5	128 57.2	127	·19 17.9	+ 58
16	71 57.3	15 29.8	48.3	137 16.8	20.1	287 24.7	20.0	191 10.7	29.5	143 28.9	128	19 12.1	+ 59
17	86 59.8	30 29.6	49.0	152 17.5	19.9	302 27.2	20.0	206 13.2	29.5	158 00.7	127	19 06.2	+ 59
18	102 02.2	45 29.3	+22 49.7	167 18.3	−22 19.7	317 29.8	+15 20.0	221 15.8	−18 29.5	172 32.4	129	−19 00.3	+ 60
19	117 04.7	60 29.1	50.5	182 19.0	19.5	332 32.4	20.1	236 18.3	29.4	187 04.3	128	18 54.3	+ 61
20	132 07.2	75 28.9	51.2	197 19.7	19.3	347 35.0	20.1	251 20.9	29.4	201 36.1	129	18 48.2	+ 62
21	147 09.6	90 28.6	·· 51.9	212 20.5	·· 19.1	2 37.5	·· 20.1	266 23.5	·· 29.4	216 08.0	129	·18 42.0	+ 63
22	162 12.1	105 28.4	52.6	227 21.2	18.9	17 40.1	20.2	281 26.0	29.4	230 39.9	129	18 35.7	+ 63
23	177 14.6	120 28.2	53.3	242 21.9	18.7	32 42.7	20.2	296 28.6	29.3	245 11.8	130	18 29.4	+ 64
4 00	192 17.0	135 27.9	+22 54.1	257 22.6	−22 18.4	47 45.2	+15 20.2	311 31.1	−18 29.3	259 43.8	130	−18 23.0	+ 66
01	207 19.5	150 27.7	54.8	272 23.4	18.2	62 47.8	20.2	326 33.7	29.3	274 15.8	131	18 16.4	+ 66
02	222 22.0	165 27.5	55.5	287 24.1	18.0	77 50.4	20.3	341 36.2	29.3	288 47.9	130	18 09.8	+ 66
03	237 24.4	180 27.2	·· 56.2	302 24.8	·· 17.8	92 52.9	·· 20.3	356 38.8	·· 29.2	303 19.9	131	·18 03.2	+ 68
04	252 26.9	195 27.0	56.9	317 25.6	17.6	107 55.5	20.3	11 41.4	29.2	317 52.0	132	17 56.4	+ 68
05	267 29.3	210 26.8	57.6	332 26.3	17.4	122 58.1	20.4	26 43.9	29.2	332 24.2	131	17 49.6	+ 70
06	282 31.8	225 26.5	+22 58.3	347 27.0	−22 17.2	138 00.6	+15 20.4	41 46.5	−18 29.2	346 56.3	132	−17 42.6	+ 70
07	297 34.3	240 26.3	59.0	2 27.8	17.0	153 03.2	20.4	56 49.0	29.2	1 28.5	133	17 35.6	+ 70
08	312 36.7	255 26.1	22 59.8	17 28.5	16.7	168 05.8	20.5	71 51.6	29.1	16 00.8	132	17 28.6	+ 72
09	327 39.2	270 25.8	·23 00.5	32 29.2	·· 16.5	183 08.3	·· 20.5	86 54.1	·· 29.1	30 33.0	133	·17 21.4	+ 72
10	342 41.7	285 25.6	01.2	47 30.0	16.3	198 10.9	20.5	101 56.7	29.1	45 05.3	133	17 14.2	+ 73
11	357 44.1	300 25.4	01.9	62 30.7	16.1	213 13.5	20.5	116 59.3	29.1	59 37.6	134	17 06.9	+ 74
12	12 46.6	315 25.2	+23 02.6	77 31.4	−22 15.9	228 16.0	+15 20.6	132 01.8	−18 29.0	74 10.0	134	−16 59.5	+ 75
13	27 49.1	330 24.9	03.3	92 32.2	15.7	243 18.6	20.6	147 04.4	29.0	88 42.4	134	16 52.0	+ 75
14	42 51.5	345 24.7	04.0	107 32.9	15.5	258 21.2	20.6	162 06.9	29.0	103 14.8	134	16 44.5	+ 76
15	57 54.0	0 24.5	·· 04.7	122 33.6	·· 15.2	273 23.7	·· 20.7	177 09.5	·· 29.0	117 47.2	135	·16 36.9	+ 77
16	72 56.5	15 24.2	05.4	137 34.4	15.0	288 26.3	20.7	192 12.1	28.9	132 19.7	135	16 29.2	+ 78
17	87 58.9	30 24.0	06.1	152 35.1	14.8	303 28.9	20.7	207 14.6	28.9	146 52.2	135	16 21.4	+ 78
18	103 01.4	45 23.8	+23 06.8	167 35.8	−22 14.6	318 31.4	+15 20.7	222 17.2	−18 28.9	161 24.7	136	−16 13.6	+ 79
19	118 03.8	60 23.5	07.5	182 36.6	14.4	333 34.0	20.8	237 19.7	28.9	175 57.3	135	16 05.7	+ 80
20	133 06.3	75 23.3	08.2	197 37.3	14.2	348 36.6	20.8	252 22.3	28.8	190 29.8	137	15 57.7	+ 80
21	148 08.8	90 23.1	·· 08.9	212 38.0	·· 13.9	3 39.1	·· 20.8	267 24.9	·· 28.8	205 02.5	136	·15 49.7	+ 82
22	163 11.2	105 22.9	09.6	227 38.8	13.7	18 41.7	20.9	282 27.4	28.8	219 35.1	137	15 41.5	+ 82
23	178 13.7	120 22.6	10.3	242 39.5	13.5	33 44.2	20.9	297 30.0	28.8	234 07.8	136	15 33.3	+ 82
5 00	193 16.2	135 22.4	+23 11.0	257 40.2	−22 13.3	48 46.8	+15 20.9	312 32.6	−18 28.8	248 40.4	138	−15 25.1	+ 84
01	208 18.6	150 22.2	11.7	272 41.0	13.1	63 49.4	20.9	327 35.1	28.7	263 13.2	137	15 16.7	+ 84
02	223 21.1	165 21.9	12.4	287 41.7	12.8	78 51.9	21.0	342 37.7	28.7	277 45.9	138	15 08.3	+ 84
03	238 23.6	180 21.7	·· 13.1	302 42.4	·· 12.6	93 54.5	·· 21.0	357 40.2	·· 28.7	292 18.7	137	·14 59.9	+ 86
04	253 26.0	195 21.5	13.8	317 43.2	12.4	108 57.1	21.0	12 42.8	28.7	306 51.4	139	14 51.3	+ 86
05	268 28.5	210 21.2	14.5	332 43.9	12.2	123 59.6	21.0	27 45.4	28.6	321 24.3	138	14 42.7	+ 87
06	283 31.0	225 21.0	+23 15.2	347 44.6	−22 12.0	139 02.2	+15 21.1	42 47.9	−18 28.6	335 57.1	138	−14 34.0	+ 87
07	298 33.4	240 20.8	15.8	2 45.4	11.7	154 04.7	21.1	57 50.5	28.6	350 29.9	139	14 25.3	+ 88
08	313 35.9	255 20.6	16.5	17 46.1	11.5	169 07.3	21.1	72 53.1	28.6	5 02.8	139	14 16.5	+ 89
09	328 38.3	270 20.3	·· 17.2	32 46.8	·· 11.3	184 09.9	·· 21.2	87 55.6	·· 28.5	19 35.7	140	·14 07.6	+ 89
10	343 40.8	285 20.1	17.9	47 47.6	11.1	199 12.4	21.2	102 58.2	28.5	34 08.7	139	13 58.7	+ 90
11	358 43.3	300 19.9	18.6	62 48.3	10.9	214 15.0	21.2	118 00.7	28.5	48 41.6	140	13 49.7	+ 91
12	13 45.7	315 19.7	+23 19.3	77 49.1	−22 10.6	229 17.5	+15 21.2	133 03.3	−18 28.5	63 14.6	140	−13 40.6	+ 91
13	28 48.2	330 19.4	20.0	92 49.8	10.4	244 20.1	21.3	148 05.9	28.4	77 47.6	140	13 31.5	+ 92
14	43 50.7	345 19.2	20.6	107 50.5	10.2	259 22.6	21.3	163 08.4	28.4	92 20.6	140	13 22.3	+ 93
15	58 53.1	0 19.0	·· 21.3	122 51.3	·· 10.0	274 25.2	·· 21.3	178 11.0	·· 28.4	106 53.6	140	·13 13.0	+ 93
16	73 55.6	15 18.7	22.0	137 52.0	09.8	289 27.8	21.3	193 13.6	28.4	121 26.6	141	13 03.7	+ 94
17	88 58.1	30 18.5	22.7	152 52.7	09.5	304 30.3	21.4	208 16.1	28.3	135 59.7	141	12 54.3	+ 94
18	104 00.5	45 18.3	+23 23.4	167 53.5	−22 09.3	319 32.9	+15 21.4	223 18.7	−18 28.3	150 32.8	141	−12 44.9	+ 95
19	119 03.0	60 18.1	24.0	182 54.2	09.1	334 35.4	21.4	238 21.3	28.3	165 05.9	141	12 35.4	+ 96
20	134 05.4	75 17.8	24.7	197 54.9	08.9	349 38.0	21.4	253 23.8	28.3	179 39.0	141	12 25.8	+ 96
21	149 07.9	90 17.6	·· 25.4	212 55.7	·· 08.6	4 40.5	·· 21.5	268 26.4	·· 28.2	194 12.1	142	·12 16.2	+ 97
22	164 10.4	105 17.4	26.1	227 56.4	08.4	19 43.1	21.5	283 28.9	28.2	208 45.3	141	12 06.5	+ 97
23	179 12.8	120 17.2	26.7	242 57.2	08.2	34 45.6	21.5	298 31.5	28.2	223 18.4	142	11 56.8	+ 98
24	194 15.3	135 16.9	+23 27.4	257 57.9	−22 08.0	49 48.2	+15 21.5	313 34.1	−18 28.2	237 51.6	142	−11 47.0	+ 98
code	—	− 3	+ 7	+ 8	+ 2	+ 26	0	+ 26	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
3 00	179 08.6	+ 5 13.1
01	194 08.8	14.0
02	209 09.0	15.0
03	224 09.1	·· 16.0
04	239 09.3	16.9
05	254 09.5	17.9
06	269 09.7	+ 5 18.8
07	284 09.9	19.8
08	299 10.1	20.7
09	314 10.3	·· 21.7
10	329 10.4	22.7
11	344 10.6	23.6
12	359 10.8	+ 5 24.6
13	14 11.0	25.5
14	29 11.2	26.5
15	44 11.4	·· 27.4
16	59 11.5	28.4
17	74 11.7	29.3
18	89 11.9	+ 5 30.3
19	104 12.1	31.3
20	119 12.3	32.2
21	134 12.5	·· 33.2
22	149 12.6	34.1
23	164 12.8	35.1
4 00	179 13.0	+ 5 36.0
01	194 13.2	37.0
02	209 13.4	37.9
03	224 13.6	·· 38.9
04	239 13.7	39.8
05	254 13.9	40.8
06	269 14.1	+ 5 41.8
07	284 14.3	42.7
08	299 14.5	43.7
09	314 14.7	·· 44.6
10	329 14.8	45.6
11	344 15.0	46.5
12	359 15.2	+ 5 47.5
13	14 15.4	48.4
14	29 15.6	49.4
15	44 15.8	·· 50.3
16	59 15.9	51.3
17	74 16.1	52.2
18	89 16.3	+ 5 53.2
19	104 16.5	54.1
20	119 16.7	55.1
21	134 16.8	·· 56.0
22	149 17.0	57.0
23	164 17.2	57.9
5 00	179 17.4	+ 5 58.9
01	194 17.6	5 59.8
02	209 17.8	6 00.8
03	224 17.9	·· 01.7
04	239 18.1	02.7
05	254 18.3	03.6
06	269 18.5	+ 6 04.6
07	284 18.7	05.5
08	299 18.8	06.5
09	314 19.0	·· 07.4
10	329 19.2	08.4
11	344 19.4	09.3
12	359 19.6	+ 6 10.3
13	14 19.7	11.2
14	29 19.9	12.2
15	44 20.1	·· 13.1
16	59 20.3	14.1
17	74 20.5	15.0
18	89 20.6	+ 6 16.0
19	104 20.8	16.9
20	119 21.0	17.9
21	134 21.2	·· 18.8
22	149 21.4	19.7
23	164 21.5	20.7
24	179 21.7	+ 6 21.6
code	—	+ 9

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.2	−40 28.9
5	Achernar	335 59.1	−57 27.5
30	Acrux	173 56.7	−62 51.6
19	Adhara	255 46.2	−28 55.0
10	Aldebaran	291 38.8	+16 25.3
32	Alioth	166 57.6	+56 11.7
34	Alkaid	153 32.1	+49 31.7
55	Al Na'ir	28 37.8	−47 10.2
15	Alnilam	276 30.0	− 1 13.9
25	Alphard	218 38.0	− 8 28.4
41	Alphecca	126 47.0	+26 51.4
1	Alpheratz	358 28.3	+28 50.9
51	Altair	62 50.1	+ 8 45.0
2	Ankaa	353 58.3	−42 32.6
42	Antares	113 18.7	−26 20.2
37	Arcturus	146 34.5	+19 24.3
43	Atria	108 58.7	−68 56.8
22	Avior	234 35.4	−59 22.5
13	Bellatrix	279 18.1	+ 6 18.6
16	Betelg'se	271 47.8	+ 7 23.9
17	Canopus	264 15.3	−52 40.6
12	Capella	281 38.0	+45 57.4
53	Deneb	50 00.9	+45 07.2
28	Denebola	183 17.0	+14 48.8
4	Diphda	349 39.2	−18 13.6
27	Dubhe	194 43.5	+61 59.2
14	Elnath	279 07.0	+28 34.3
47	Eltanin	91 05.9	+51 29.3
54	Enif	34 29.4	+ 9 40.4
56	Fomalhaut	16 11.5	−29 51.2
31	Gacrux	172 48.2	−56 52.3
29	Gienah	176 36.1	−17 18.2
35	Hadar	149 48.2	−60 09.8
6	Hamal	328 49.5	+23 15.4
48	Kaus Aust.	84 40.6	−34 24.3
40	Kochab	137 16.9	+74 19.8
57	Markab	14 21.3	+14 58.1
8	Menkar	315 00.2	+ 3 55.1
36	Menkent	148 57.8	−36 09.5
24	Miapl'dus	221 48.4	−69 32.6
9	Mirfak	309 42.2	+49 42.5
50	Nunki	76 51.4	−26 21.1
52	Peacock	54 26.9	−56 52.4
21	Pollux	244 20.0	+28 08.0
20	Procyon	245 44.5	+ 5 20.1
46	R'alhague	96 46.1	+12 35.3
26	Regulus	208 28.9	+12 10.7
11	Rigel	281 53.4	− 8 15.2
38	Rigil Kent.	140 49.8	−60 39.4
44	Sabik	103 01.6	−15 40.4
3	Schedar	350 30.1	+56 17.9
45	Shaula	97 20.0	−37 04.3
18	Sirius	259 11.5	−16 39.6
33	Spica	159 16.2	−10 56.2
23	Suhail	223 23.8	−43 15.7
49	Vega	81 07.9	+38 44.3
39	Zub'g'bi	137 52.6	−15 51.8

Lat.	Sunrise	Twlt. begins
N °	h m	h m
72	4 40	////
70	4 49	////
68	4 56	////
66	5 03	0 45
64	5 08	1 43
62	5 12	2 14
60	5 16	2 36
58	5 20	2 53
56	5 23	3 06
54	5 26	3 18
52	5 28	3 28
50	5 30	3 36
45	5 35	3 54
40	5 39	4 08
35	5 43	4 17
30	5 46	4 26
20	5 51	4 38
10	5 56	4 46
0	6 00	4 51
10	6 04	4 54
20	6 08	4 54
30	6 12	4 53
35	6 15	4 50
40	6 18	4 47
45	6 21	4 43
50	6 25	4 37
52	6 27	4 33
54	6 29	4 29
56	6 31	4 25
58	6 34	4 20
60	6 36	4 15
S		

Lat.	Sunset	Twlt. ends
N °	h m	h m
72	19 29	////
70	19 20	////
68	19 12	////
66	19 05	24 01
64	19 00	22 33
62	18 55	22 00
60	18 51	21 36
58	18 48	21 19
56	18 44	21 04
54	18 42	20 52
52	18 39	20 42
50	18 37	20 33
45	18 32	20 15
40	18 27	20 01
35	18 24	19 51
30	18 21	19 42
20	18 15	19 29
10	18 11	19 21
0	18 06	19 15
10	18 02	19 12
20	17 58	19 11
30	17 53	19 12
35	17 50	19 14
40	17 47	19 17
45	17 44	19 21
50	17 40	19 27
52	17 38	19 30
54	17 36	19 34
56	17 34	19 38
58	17 31	19 42
60	17 28	19 47
S		

Moonrise	3	4	5	6
N °	h m	h m	h m	h m
72	▬	6 15	5 12	4 46
70	▬	5 01	4 41	4 28
68	4 30	4 23	4 18	4 13
66	3 49	3 57	4 00	4 02
64	3 21	3 36	3 45	3 52
62	2 59	3 19	3 33	3 43
60	2 42	3 05	3 22	3 36
58	2 27	2 53	3 13	3 30
56	2 15	2 43	3 05	3 24
54	2 04	2 34	2 58	3 19
52	1 54	2 25	2 52	3 14
50	1 45	2 18	2 46	3 10
45	1 27	2 02	2 33	3 01
40	1 12	1 49	2 22	2 53
35	0 59	1 38	2 13	2 46
30	0 48	1 28	2 06	2 40
20	0 28	1 11	1 52	2 30
10	0 12	0 57	1 40	2 21
0	24 43	0 43	1 28	2 13
10	24 29	0 29	1 17	2 04
20	24 14	0 14	1 05	1 55
30	23 57	24 51	0 51	1 45
35	23 47	24 43	0 43	1 39
40	23 36	24 34	0 34	1 32
45	23 23	24 23	0 23	1 25
50	23 06	24 10	0 10	1 15
52	22 59	24 03	0 03	1 10
54	22 50	23 57	25 06	1 06
56	22 40	23 49	25 00	1 00
58	22 29	23 40	24 54	0 54
60	22 17	23 31	24 47	0 47

Moonset	3	4	5	6
N °	h m	h m	h m	h m
72	▬	7 46	10 24	12 22
70	▬	8 59	10 53	12 38
68	7 53	9 36	11 15	12 51
66	8 33	10 02	11 32	13 02
64	9 01	10 22	11 46	13 10
62	9 22	10 38	11 57	13 18
60	9 39	10 51	12 07	13 24
58	9 53	11 03	12 15	13 30
56	10 05	11 13	12 23	13 35
54	10 16	11 21	12 29	13 39
52	10 26	11 29	12 35	13 43
50	10 34	11 36	12 41	13 47
45	10 52	11 51	12 52	13 55
40	11 07	12 04	13 02	14 01
35	11 19	12 14	13 10	14 07
30	11 30	12 23	13 17	14 11
20	11 48	12 39	13 29	14 20
10	12 04	12 52	13 40	14 27
0	12 19	13 05	13 50	14 34
10	12 34	13 18	14 00	14 41
20	12 49	13 31	14 10	14 48
30	13 07	13 46	14 22	14 56
35	13 18	13 55	14 29	15 01
40	13 30	14 05	14 37	15 06
45	13 44	14 17	14 46	15 12
50	14 01	14 31	14 57	15 20
52	14 09	14 38	15 02	15 23
54	14 18	14 45	15 07	15 27
56	14 28	14 53	15 13	15 31
58	14 39	15 02	15 20	15 35
60	14 52	15 12	15 28	15 40

GMT	Equation of Time (App.—Mean) 3	4	5
h	m s	m s	m s
0	− 3 26.0	− 3 08.3	− 2 50.8
6	− 3 21.6	− 3 03.9	− 2 46.5
12	− 3 17.1	− 2 59.5	− 2 42.1
18	− 3 12.7	− 2 55.2	− 2 37.8
24	− 3 08.3	− 2 50.8	− 2 33.5

GMT of Transit Meridian of Greenwich	DAY	Moon	Venus	Mars	Jupiter	Saturn
		h m	h m	h m	h m	h m
	3	6 07	14 58	6 51	20 50	3 18
	4	6 54	14 58	6 50	20 45	3 13
	5	7 39	14 59	6 49	20 41	3 09
	6	8 24	14 59	6 48	20 37	3 05

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb **Add**	Venus **Add**	Mars **Add**
°	′	′	′
0	0.3	0.2	0.1
30	0.3	0.1	0.1
45	0.3	0.1	0.1
60	0.3	0.1	0.0
75	0.3	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	3	4	5
°	′	′	′
0	12.1	12.2	12.5
4	12.1	12.3	12.5
8	12.2	12.3	12.5
12	12.2	12.3	12.6
16	12.2	12.4	12.6
20	12.3	12.4	12.7
24	12.4	12.5	12.7
28	12.5	12.6	12.8
32	12.6	12.7	12.9
36	12.7	12.8	13.0
40	12.8	12.9	13.1
44	12.9	13.0	13.2
48	13.1	13.2	13.4
52	13.2	13.3	13.5
56	13.4	13.5	13.6
60	13.5	13.6	13.8
64	13.7	13.8	13.9
68	13.9	14.0	14.1
72	14.1	14.1	14.2
76	14.3	14.3	14.4
80	14.4	14.5	14.6
84	14.6	14.7	14.7
88	14.8	14.8	14.9
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	3	4	5
°	′	′	′
0	17.5	17.4	17.3
4	17.5	17.4	17.3
8	17.5	17.4	17.3
12	17.4	17.4	17.2
16	17.4	17.3	17.2
20	17.3	17.3	17.1
24	17.2	17.2	17.1
28	17.2	17.1	17.0
32	17.1	17.0	16.9
36	16.9	16.9	16.8
40	16.8	16.8	16.7
44	16.7	16.6	16.6
48	16.6	16.5	16.4
52	16.4	16.4	16.3
56	16.2	16.2	16.2
60	16.1	16.1	16.0
64	15.9	15.9	15.9
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.2
84	15.0	15.0	15.1
88	14.9	14.9	14.9
90			

Subtract from table, back cover

Last Quarter 3

292626 O - 55 - 5

GMT	♈ GHA	VENUS −3.9 GHA	VENUS −3.9 Dec.	MARS 0.7 GHA	MARS 0.7 Dec.	JUPITER −1.9 GHA	JUPITER −1.9 Dec.	SATURN 0.5 GHA	SATURN 0.5 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
6 00	194 15.3	135 16.9	+23 27.4	257 57.9	−22 08.0	49 48.2	+15 21.5	313 34.1	−18 28.2	237 51.6	142	−11 47.0	+ 98
01	209 17.8	150 16.7	28.1	272 58.6	07.7	64 50.8	21.6	328 36.6	28.2	252 24.8	142	11 37.2	+ 99
02	224 20.2	165 16.5	28.8	287 59.4	07.5	79 53.3	21.6	343 39.2	28.1	266 58.0	142	11 27.3	+100
03	239 22.7	180 16.3	·· 29.4	303 00.1	·· 07.3	94 55.9	·· 21.6	358 41.8	·· 28.1	281 31.2	142	·11 17.3	+100
04	254 25.2	195 16.1	30.1	318 00.9	07.1	109 58.4	21.6	13 44.3	28.1	296 04.4	143	11 07.3	+101
05	269 27.6	210 15.8	30.8	333 01.6	06.8	125 01.0	21.7	28 46.9	28.1	310 37.7	142	10 57.2	+101
06	284 30.1	225 15.6	+23 31.4	348 02.3	−22 06.6	140 03.5	+15 21.7	43 49.5	−18 28.0	325 10.9	143	−10 47.1	+102
07	299 32.6	240 15.4	32.1	3 03.1	06.4	155 06.1	21.7	58 52.0	28.0	339 44.2	142	10 36.9	+102
08	314 35.0	255 15.2	32.8	18 03.8	06.2	170 08.6	21.7	73 54.6	28.0	354 17.4	143	10 26.7	+103
09	329 37.5	270 14.9	·· 33.4	33 04.5	·· 05.9	185 11.2	·· 21.8	88 57.2	·· 28.0	8 50.7	143	·10 16.4	+103
10	344 39.9	285 14.7	34.1	48 05.3	05.7	200 13.7	21.8	103 59.7	27.9	23 24.0	143	10 06.1	+104
11	359 42.4	300 14.5	34.8	63 06.0	05.5	215 16.3	21.8	119 02.3	27.9	37 57.3	143	9 55.7	+104
12	14 44.9	315 14.3	+23 35.4	78 06.8	−22 05.3	230 18.8	+15 21.8	134 04.9	−18 27.9	52 30.6	143	− 9 45.3	+105
13	29 47.3	330 14.0	36.1	93 07.5	05.0	245 21.4	21.9	149 07.4	27.9	67 03.9	143	9 34.8	+106
14	44 49.8	345 13.8	36.8	108 08.2	04.8	260 23.9	21.9	164 10.0	27.8	81 37.2	143	9 24.2	+105
15	59 52.3	0 13.6	·· 37.4	123 09.0	·· 04.6	275 26.5	·· 21.9	179 12.6	·· 27.8	96 10.5	143	· 9 13.7	+107
16	74 54.7	15 13.4	38.1	138 09.7	04.3	290 29.0	21.9	194 15.1	27.8	110 43.8	144	9 03.0	+107
17	89 57.2	30 13.2	38.7	153 10.5	04.1	305 31.6	22.0	209 17.7	27.8	125 17.2	143	8 52.3	+107
18	104 59.7	45 12.9	+23 39.4	168 11.2	−22 03.9	320 34.1	+15 22.0	224 20.3	−18 27.7	139 50.5	143	− 8 41.6	+107
19	120 02.1	60 12.7	40.0	183 11.9	03.7	335 36.7	22.0	239 22.8	27.7	154 23.8	144	8 30.9	+109
20	135 04.6	75 12.5	40.7	198 12.7	03.4	350 39.2	22.0	254 25.4	27.7	168 57.2	143	8 20.0	+108
21	150 07.1	90 12.3	·· 41.4	213 13.4	·· 03.2	5 41.8	·· 22.0	269 28.0	·· 27.7	183 30.5	143	· 8 09.2	+109
22	165 09.5	105 12.1	42.0	228 14.2	03.0	20 44.3	22.1	284 30.5	27.6	198 03.8	144	7 58.3	+110
23	180 12.0	120 11.8	42.7	243 14.9	02.7	35 46.9	22.1	299 33.1	27.6	212 37.2	143	7 47.3	+110
7 00	195 14.4	135 11.6	+23 43.3	258 15.7	−22 02.5	50 49.4	+15 22.1	314 35.7	−18 27.6	227 10.5	143	− 7 36.3	+110
01	210 16.9	150 11.4	44.0	273 16.4	02.3	65 52.0	22.1	329 38.3	27.6	241 43.8	144	7 25.3	+111
02	225 19.4	165 11.2	44.6	288 17.1	02.0	80 54.5	22.2	344 40.8	27.5	256 17.2	143	7 14.2	+111
03	240 21.8	180 11.0	·· 45.3	303 17.9	·· 01.8	95 57.1	·· 22.2	359 43.4	·· 27.5	270 50.5	143	· 7 03.1	+111
04	255 24.3	195 10.7	45.9	318 18.6	01.6	110 59.6	22.2	14 46.0	27.5	285 23.8	143	6 52.0	+112
05	270 26.8	210 10.5	46.6	333 19.4	01.3	126 02.1	22.2	29 48.5	27.5	299 57.1	143	6 40.8	+113
06	285 29.2	225 10.3	+23 47.2	348 20.1	−22 01.1	141 04.7	+15 22.2	44 51.1	−18 27.4	314 30.4	144	− 6 29.5	+112
07	300 31.7	240 10.1	47.9	3 20.8	00.9	156 07.2	22.3	59 53.7	27.4	329 03.8	143	6 18.3	+113
08	315 34.2	255 09.9	48.5	18 21.6	00.6	171 09.8	22.3	74 56.2	27.4	343 37.1	142	6 07.0	+114
09	330 36.6	270 09.7	·· 49.1	33 22.3	·· 00.4	186 12.3	·· 22.3	89 58.8	·· 27.4	358 10.3	143	· 5 55.6	+114
10	345 39.1	285 09.4	49.8	48 23.1	22 00.2	201 14.9	22.3	105 01.4	27.3	12 43.6	143	5 44.2	+114
11	0 41.5	300 09.2	50.4	63 23.8	21 59.9	216 17.4	22.4	120 04.0	27.3	27 16.9	143	5 32.8	+114
12	15 44.0	315 09.0	+23 51.1	78 24.6	−21 59.7	231 20.0	+15 22.4	135 06.5	−18 27.3	41 50.2	142	− 5 21.4	+115
13	30 46.5	330 08.8	51.7	93 25.3	59.5	246 22.5	22.4	150 09.1	27.3	56 23.4	143	5 09.9	+115
14	45 48.9	345 08.6	52.3	108 26.0	59.2	261 25.0	22.4	165 11.7	27.2	70 56.7	142	4 58.4	+116
15	60 51.4	0 08.4	·· 53.0	123 26.8	·· 59.0	276 27.6	·· 22.4	180 14.2	·· 27.2	85 29.9	142	· 4 46.8	+116
16	75 53.9	15 08.1	53.6	138 27.5	58.8	291 30.1	22.5	195 16.8	27.2	100 03.1	142	4 35.2	+116
17	90 56.3	30 07.9	54.3	153 28.3	58.5	306 32.7	22.5	210 19.4	27.2	114 36.3	142	4 23.6	+116
18	105 58.8	45 07.7	+23 54.9	168 29.0	−21 58.3	321 35.2	+15 22.5	225 22.0	−18 27.1	129 09.5	142	− 4 12.0	+117
19	121 01.3	60 07.5	55.5	183 29.8	58.1	336 37.7	22.5	240 24.5	27.1	143 42.7	142	4 00.3	+117
20	136 03.7	75 07.3	56.2	198 30.5	57.8	351 40.3	22.5	255 27.1	27.1	158 15.9	141	3 48.6	+118
21	151 06.2	90 07.1	·· 56.8	213 31.3	·· 57.6	6 42.8	·· 22.6	270 29.7	·· 27.1	172 49.0	141	· 3 36.8	+117
22	166 08.7	105 06.9	57.4	228 32.0	57.4	21 45.4	22.6	285 32.2	27.0	187 22.1	141	3 25.1	+118
23	181 11.1	120 06.7	58.0	243 32.7	57.1	36 47.9	22.6	300 34.8	27.0	201 55.2	141	3 13.3	+118
8 00	196 13.6	135 06.4	+23 58.7	258 33.5	−21 56.9	51 50.4	+15 22.6	315 37.4	−18 27.0	216 28.3	141	− 3 01.5	+118
01	211 16.0	150 06.2	59.3	273 34.2	56.7	66 53.0	22.6	330 40.0	26.9	231 01.4	141	2 49.7	+119
02	226 18.5	165 06.0	23 59.9	288 35.0	56.4	81 55.5	22.7	345 42.5	26.9	245 34.5	140	2 37.8	+119
03	241 21.0	180 05.8	·24 00.6	303 35.7	·· 56.2	96 58.1	·· 22.7	0 45.1	·· 26.9	260 07.5	140	· 2 25.9	+119
04	256 23.4	195 05.6	01.2	318 36.5	55.9	112 00.6	22.7	15 47.7	26.9	274 40.5	140	2 14.0	+119
05	271 25.9	210 05.4	01.8	333 37.2	55.7	127 03.1	22.7	30 50.2	26.8	289 13.5	139	2 02.1	+120
06	286 28.4	225 05.2	+24 02.4	348 38.0	−21 55.5	142 05.7	+15 22.7	45 52.8	−18 26.8	303 46.4	140	− 1 50.1	+120
07	301 30.8	240 05.0	03.1	3 38.7	55.2	157 08.2	22.8	60 55.4	26.8	318 19.4	139	1 38.1	+119
08	316 33.3	255 04.7	03.7	18 39.5	55.0	172 10.7	22.8	75 58.0	26.8	332 52.3	139	1 26.2	+121
09	331 35.8	270 04.5	·· 04.3	33 40.2	·· 54.8	187 13.3	·· 22.8	91 00.5	·· 26.7	347 25.2	138	· 1 14.1	+120
10	346 38.2	285 04.3	04.9	48 40.9	54.5	202 15.8	22.8	106 03.1	26.7	1 58.0	139	1 02.1	+120
11	1 40.7	300 04.1	05.5	63 41.7	54.3	217 18.4	22.8	121 05.7	26.7	16 30.9	138	0 50.1	+121
12	16 43.2	315 03.9	+24 06.2	78 42.4	−21 54.0	232 20.9	+15 22.8	136 08.3	−18 26.7	31 03.7	138	− 0 38.0	+121
13	31 45.6	330 03.7	06.8	93 43.2	53.8	247 23.4	22.9	151 10.8	26.6	45 36.5	137	0 25.9	+120
14	46 48.1	345 03.5	07.4	108 43.9	53.6	262 26.0	22.9	166 13.4	26.6	60 09.2	137	0 13.9	+122
15	61 50.5	0 03.3	·· 08.0	123 44.7	·· 53.3	277 28.5	·· 22.9	181 16.0	·· 26.6	74 41.9	137	− 0 01.7	+121
16	76 53.0	15 03.1	08.6	138 45.4	53.1	292 31.0	22.9	196 18.6	26.6	89 14.6	136	+ 0 10.4	+121
17	91 55.5	30 02.9	09.2	153 46.2	52.8	307 33.6	22.9	211 21.1	26.5	103 47.2	137	0 22.5	+121
18	106 57.9	45 02.7	+24 09.9	168 46.9	−21 52.6	322 36.1	+15 23.0	226 23.7	−18 26.5	118 19.9	135	+ 0 34.6	+122
19	122 00.4	60 02.5	10.5	183 47.7	52.4	337 38.6	23.0	241 26.3	26.5	132 52.4	136	0 46.8	+121
20	137 02.9	75 02.2	11.1	198 48.4	52.1	352 41.2	23.0	256 28.9	26.5	147 25.0	135	0 58.9	+122
21	152 05.3	90 02.0	·· 11.7	213 49.2	·· 51.9	7 43.7	·· 23.0	271 31.4	·· 26.4	161 57.5	135	· 1 11.1	+122
22	167 07.8	105 01.8	12.3	228 49.9	51.6	22 46.2	23.0	286 34.0	26.4	176 30.0	134	1 23.3	+122
23	182 10.3	120 01.6	12.9	243 50.7	51.4	37 48.8	23.0	301 36.6	26.4	191 02.4	134	1 35.5	+121
24	197 12.7	135 01.4	+24 13.5	258 51.4	−21 51.1	52 51.3	+15 23.1	316 39.2	−18 26.4	205 34.8	134	+ 1 47.6	+122
code	−	− 2	+ 6	+ 7	+ 2	+ 25	0	+ 26	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
6 00	179 21.7	+ 6 21.6
01	194 21.9	22.6
02	209 22.1	23.5
03	224 22.3	24.5
04	239 22.4	25.4
05	254 22.6	26.4
06	269 22.8	+ 6 27.3
07	284 23.0	28.3
08	299 23.1	29.2
09	314 23.3	30.1
10	329 23.5	31.1
11	344 23.7	32.0
12	359 23.9	+ 6 33.0
13	14 24.0	33.9
14	29 24.2	34.9
15	44 24.4	35.8
16	59 24.6	36.7
17	74 24.7	37.7
18	89 24.9	+ 6 38.6
19	104 25.1	39.6
20	119 25.3	40.5
21	134 25.5	41.5
22	149 25.6	42.4
23	164 25.8	43.3
7 00	179 26.0	+ 6 44.3
01	194 26.2	45.2
02	209 26.3	46.2
03	224 26.5	47.1
04	239 26.7	48.0
05	254 26.9	49.0
06	269 27.0	+ 6 49.9
07	284 27.2	50.9
08	299 27.4	51.8
09	314 27.6	52.7
10	329 27.8	53.7
11	344 27.9	54.6
12	359 28.1	+ 6 55.6
13	14 28.3	56.5
14	29 28.5	57.4
15	44 28.6	58.4
16	59 28.8	6 59.3
17	74 29.0	7 00.3
18	89 29.2	+ 7 01.2
19	104 29.3	02.1
20	119 29.5	03.1
21	134 29.7	04.0
22	149 29.9	04.9
23	164 30.0	05.9
8 00	179 30.2	+ 7 06.8
01	194 30.4	07.7
02	209 30.6	08.7
03	224 30.7	09.6
04	239 30.9	10.6
05	254 31.1	11.5
06	269 31.3	+ 7 12.4
07	284 31.4	13.4
08	299 31.6	14.3
09	314 31.8	15.2
10	329 31.9	16.2
11	344 32.1	17.1
12	359 32.3	+ 7 18.0
13	14 32.5	19.0
14	29 32.6	19.9
15	44 32.8	20.8
16	59 33.0	21.8
17	74 33.2	22.7
18	89 33.3	+ 7 23.6
19	104 33.5	24.6
20	119 33.7	25.5
21	134 33.8	26.4
22	149 34.0	27.4
23	164 34.2	28.3
24	179 34.4	+ 7 29.2
code	—	+ 9

STARS No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 51.2	−40 28.9
5	Achernar	335 59.1	−57 27.5
30	Acrux	173 56.7	−62 51.6
19	Adhara	255 46.3	−28 55.0
10	Aldebaran	291 38.8	+16 25.3
32	Alioth	166 57.6	+56 11.7
34	Alkaid	153 32.1	+49 31.7
55	Al Na'ir	28 37.8	−47 10.2
15	Alnilam	276 30.0	− 1 13.9
25	Alphard	218 38.0	− 8 28.4
41	Alphecca	126 47.0	+26 51.4
1	Alpheratz	358 28.3	+28 50.9
51	Altair	62 50.1	+ 8 45.0
2	Ankaa	353 58.3	−42 32.5
42	Antares	113 18.6	−26 20.2
37	Arcturus	146 34.5	+19 24.4
43	Atria	108 58.7	−68 56.8
22	Avior	234 35.4	−59 22.5
13	Bellatrix	279 18.1	+ 6 18.6
16	Betelg'se	271 47.8	+ 7 23.9
17	Canopus	264 15.3	−52 40.6
12	Capella	281 38.1	+45 57.4
53	Deneb	50 00.9	+45 07.2
28	Denebola	183 17.0	+14 48.8
4	Diphda	349 39.2	−18 13.6
27	Dubhe	194 43.6	+61 59.2
14	Elnath	279 07.0	+28 34.3
47	Eltanin	91 05.9	+51 29.3
54	Enif	34 29.4	+ 9 40.4
56	Fomalhaut	16 11.5	−29 51.2
31	Gacrux	172 48.2	−56 52.3
29	Gienah	176 36.1	−17 18.2
35	Hadar	149 48.2	−60 09.9
6	Hamal	328 49.5	+23 15.4
48	Kaus Aust.	84 40.6	−34 24.3
40	Kochab	137 16.9	+74 19.9
57	Markab	14 21.3	+14 58.1
8	Menkar	315 00.2	+ 3 55.1
36	Menkent	148 57.8	−36 09.5
24	Miapl'dus	221 48.5	−69 32.6
9	Mirfak	309 42.2	+49 42.5
50	Nunki	76 51.4	−26 21.1
52	Peacock	54 26.8	−56 52.3
21	Pollux	244 20.1	+28 08.0
20	Procyon	245 44.6	+ 5 20.1
46	R'alhague	96 46.1	+12 35.3
26	Regulus	208 28.9	+12 10.7
11	Rigel	281 53.4	− 8 15.2
38	Rigil Kent.	140 49.8	−60 39.4
44	Sabik	103 01.5	−15 40.4
3	Schedar	350 30.1	+56 17.9
45	Shaula	97 20.0	−37 04.3
18	Sirius	259 11.6	−16 39.6
33	Spica	159 16.1	−10 56.2
23	Suhail	223 23.8	−43 15.7
49	Vega	81 07.9	+38 44.3
39	Zub'g'bi	137 52.6	−15 51.8

Lat.	Sunrise	Twlt. begins	Moonrise 6	7	8	9
N °	h m	h m	h m	h m	h m	h m
72	4 24	////	4 46	4 27	4 10	3 54
70	4 35	////	4 28	4 17	4 07	3 58
68	4 44	////	4 13	4 09	4 05	4 00
66	4 51	////	4 02	4 02	4 03	4 03
64	4 57	1 15	3 52	3 57	4 01	4 05
62	5 03	1 55	3 43	3 52	3 59	4 06
60	5 07	2 21	3 36	3 47	3 58	4 08
58	5 11	2 40	3 30	3 44	3 57	4 09
56	5 15	2 56	3 24	3 40	3 55	4 11
54	5 18	3 09	3 19	3 37	3 54	4 12
52	5 21	3 20	3 14	3 34	3 53	4 13
50	5 24	3 29	3 10	3 32	3 53	4 14
45	5 30	3 48	3 01	3 26	3 51	4 16
40	5 35	4 02	2 53	3 21	3 49	4 17
35	5 39	4 13	2 46	3 17	3 48	4 19
30	5 42	4 22	2 40	3 14	3 47	4 20
20	5 49	4 35	2 30	3 08	3 45	4 22
10	5 54	4 43	2 21	3 02	3 43	4 24
0	5 59	4 50	2 13	2 57	3 41	4 26
10	6 04	4 54	2 04	2 52	3 40	4 28
20	6 09	4 55	1 55	2 46	3 38	4 30
30	6 14	4 55	1 45	2 40	3 36	4 33
35	6 17	4 53	1 39	2 36	3 35	4 34
40	6 21	4 50	1 32	2 32	3 33	4 36
45	6 25	4 47	1 25	2 27	3 32	4 38
50	6 30	4 41	1 15	2 22	3 30	4 40
52	6 32	4 38	1 10	2 19	3 29	4 41
54	6 35	4 35	1 06	2 16	3 28	4 42
56	6 37	4 31	1 00	2 13	3 27	4 44
58	6 40	4 27	0 54	2 09	3 26	4 45
60	6 44	4 22	0 47	2 05	3 25	4 47
S						

Lat.	Sunset	Twlt. ends	Moonset 6	7	8	9
N °	h m	h m	h m	h m	h m	h m
72	19 44	////	12 22	14 14	16 04	17 58
70	19 32	////	12 38	14 21	16 04	17 50
68	19 23	////	12 51	14 27	16 04	17 43
66	19 15	////	13 02	14 32	16 04	17 38
64	19 09	23 03	13 10	14 36	16 04	17 34
62	19 03	22 17	13 18	14 40	16 04	17 30
60	18 59	21 51	13 24	14 43	16 04	17 26
58	18 54	21 29	13 30	14 46	16 03	17 23
56	18 51	21 14	13 35	14 48	16 03	17 21
54	18 47	21 00	13 39	14 50	16 03	17 18
52	18 44	20 49	13 43	14 52	16 03	17 16
50	18 41	20 39	13 47	14 54	16 03	17 14
45	18 35	20 19	13 55	14 58	16 03	17 10
40	18 30	20 05	14 01	15 02	16 03	17 07
35	18 26	19 53	14 07	15 04	16 03	17 04
30	18 22	19 44	14 11	15 07	16 03	17 01
20	18 16	19 31	14 20	15 11	16 03	16 56
10	18 10	19 21	14 27	15 15	16 03	16 52
0	18 05	19 14	14 34	15 18	16 03	16 49
10	18 01	19 11	14 41	15 22	16 03	16 45
20	17 55	19 08	14 48	15 25	16 02	16 41
30	17 50	19 09	14 56	15 29	16 02	16 36
35	17 46	19 10	15 01	15 32	16 02	16 33
40	17 43	19 13	15 06	15 34	16 02	16 30
45	17 38	19 15	15 12	15 37	16 02	16 27
50	17 34	19 21	15 20	15 41	16 01	16 23
52	17 31	19 23	15 23	15 42	16 01	16 21
54	17 29	19 27	15 27	15 44	16 01	16 19
56	17 26	19 30	15 31	15 46	16 01	16 17
58	17 23	19 34	15 35	15 48	16 01	16 14
60	17 20	19 39	15 40	15 51	16 01	16 11
S						

Equation of Time (App. − Mean)

GMT	6 m s	7 m s	8 m s
h			
0	− 2 33.5	− 2 16.4	− 1 59.5
6	− 2 29.2	− 2 12.2	− 1 55.3
12	− 2 24.9	− 2 07.9	− 1 51.2
18	− 2 20.7	− 2 03.7	− 1 47.0
24	− 2 16.4	− 1 59.5	− 1 42.9

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
6	8 24	14 59	6 48	20 37	3 05
7	9 08	14 59	6 47	20 33	3 01
8	9 52	15 00	6 45	20 29	2 57
9	10 37	15 00	6 44	20 25	2 53

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.3	0.2	0.1
30	0.3	0.2	0.1
45	0.3	0.1	0.1
60	0.3	0.1	0.0
75	0.3	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt. °	6 ′	7 ′	8 ′
0	13.1	13.8	14.5
4	13.1	13.8	14.5
8	13.2	13.8	14.5
12	13.2	13.8	14.6
16	13.2	13.8	14.6
20	13.3	13.9	14.6
24	13.3	13.9	14.6
28	13.4	14.0	14.6
32	13.5	14.0	14.7
36	13.5	14.1	14.7
40	13.6	14.1	14.7
44	13.7	14.2	14.8
48	13.8	14.3	14.8
52	13.9	14.3	14.9
56	14.0	14.4	14.9
60	14.1	14.5	15.0
64	14.3	14.6	15.0
68	14.4	14.7	15.1
72	14.5	14.8	15.1
76	14.6	14.9	15.2
80	14.8	15.0	15.2
84	14.9	15.1	15.3
88	15.0	15.1	15.3
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt. °	6 ′	7 ′	8 ′
0	16.9	16.6	16.1
4	16.9	16.6	16.1
8	16.9	16.5	16.1
12	16.9	16.5	16.1
16	16.8	16.5	16.1
20	16.8	16.5	16.1
24	16.7	16.4	16.1
28	16.7	16.4	16.0
32	16.6	16.3	16.0
36	16.5	16.3	16.0
40	16.4	16.2	15.9
44	16.4	16.1	15.9
48	16.3	16.1	15.8
52	16.2	16.0	15.8
56	16.0	15.9	15.8
60	15.9	15.8	15.7
64	15.8	15.7	15.7
68	15.7	15.6	15.6
72	15.6	15.6	15.6
76	15.4	15.5	15.5
80	15.3	15.4	15.4
84	15.2	15.3	15.4
88	15.1	15.2	15.3
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.9 GHA	Dec	MARS 0.6 GHA	Dec	JUPITER −1.9 GHA	Dec	SATURN 0.4 GHA	Dec	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
9 00	197 12.7	135 01.4	+24 13.5	258 51.4	−21 51.1	52 51.3	+15 23.1	316 39.2	−18 26.4	205 34.8	134	+ 1 47.6	+122
01	212 15.2	150 01.2	14.1	273 52.2	50.9	67 53.8	23.1	331 41.7	26.3	220 07.2	133	1 59.8	+122
02	227 17.6	165 01.0	14.7	288 52.9	50.7	82 56.4	23.1	346 44.3	26.3	234 39.5	133	2 12.0	+122
03	242 20.1	180 00.8	·· 15.3	303 53.7	·· 50.4	97 58.9	·· 23.1	1 46.9	·· 26.3	249 11.8	132	· 2 24.2	+122
04	257 22.6	195 00.6	15.9	318 54.4	50.2	113 01.4	23.1	16 49.5	26.2	263 44.0	132	2 36.4	+122
05	272 25.0	210 00.4	16.5	333 55.2	49.9	128 03.9	23.2	31 52.1	26.2	278 16.2	132	2 48.6	+122
06	287 27.5	225 00.2	+24 17.1	348 55.9	−21 49.7	143 06.5	+15 23.2	46 54.6	−18 26.2	292 48.4	131	+ 3 00.8	+122
07	302 30.0	240 00.0	17.7	3 56.7	49.4	158 09.0	23.2	61 57.2	26.2	307 20.5	131	3 13.0	+122
08	317 32.4	254 59.8	18.3	18 57.4	49.2	173 11.5	23.2	76 59.8	26.1	321 52.6	130	3 25.2	+122
09	332 34.9	269 59.6	·· 18.9	33 58.2	·· 48.9	188 14.1	·· 23.2	92 02.4	·· 26.1	336 24.6	130	· 3 37.4	+122
10	347 37.4	284 59.4	19.5	48 58.9	48.7	203 16.6	23.2	107 04.9	26.1	350 56.6	129	3 49.6	+122
11	2 39.8	299 59.2	20.1	63 59.7	48.5	218 19.1	23.2	122 07.5	26.1	5 28.5	129	4 01.8	+121
12	17 42.3	314 59.0	+24 20.7	79 00.4	−21 48.2	233 21.7	+15 23.3	137 10.1	−18 26.0	20 00.4	128	+ 4 13.9	+122
13	32 44.8	329 58.8	21.3	94 01.2	48.0	248 24.2	23.3	152 12.7	26.0	34 32.2	128	4 26.1	+121
14	47 47.2	344 58.6	21.9	109 01.9	47.7	263 26.7	23.3	167 15.3	26.0	49 04.0	128	4 38.2	+122
15	62 49.7	359 58.4	·· 22.5	124 02.7	·· 47.5	278 29.2	·· 23.3	182 17.8	·· 26.0	63 35.8	127	· 4 50.4	+121
16	77 52.1	14 58.2	23.1	139 03.4	47.2	293 31.8	23.3	197 20.4	25.9	78 07.5	126	5 02.5	+122
17	92 54.6	29 58.0	23.7	154 04.2	47.0	308 34.3	23.3	212 23.0	25.9	92 39.1	126	5 14.7	+121
18	107 57.1	44 57.8	+24 24.3	169 04.9	−21 46.7	323 36.8	+15 23.4	227 25.6	−18 25.9	107 10.7	125	+ 5 26.8	+121
19	122 59.5	59 57.6	24.9	184 05.7	46.5	338 39.3	23.4	242 28.1	25.9	121 42.2	125	5 38.9	+120
20	138 02.0	74 57.4	25.5	199 06.4	46.2	353 41.9	23.4	257 30.7	25.8	136 13.7	124	5 50.9	+121
21	153 04.5	89 57.2	·· 26.0	214 07.2	·· 46.0	8 44.4	·· 23.4	272 33.3	·· 25.8	150 45.1	124	· 6 03.0	+121
22	168 06.9	104 57.0	26.6	229 07.9	45.7	23 46.9	23.4	287 35.9	25.8	165 16.5	123	6 15.1	+120
23	183 09.4	119 56.8	27.2	244 08.7	45.5	38 49.4	23.4	302 38.5	25.7	179 47.8	123	6 27.1	+120
10 00	198 11.9	134 56.6	+24 27.8	259 09.4	−21 45.2	53 52.0	+15 23.4	317 41.0	−18 25.7	194 19.1	122	+ 6 39.1	+120
01	213 14.3	149 56.4	28.4	274 10.2	45.0	68 54.5	23.5	332 43.6	25.7	208 50.3	121	6 51.1	+119
02	228 16.8	164 56.2	29.0	289 10.9	44.8	83 57.0	23.5	347 46.2	25.7	223 21.4	121	7 03.0	+120
03	243 19.2	179 56.0	·· 29.5	304 11.7	·· 44.5	98 59.5	·· 23.5	2 48.8	·· 25.6	237 52.5	120	· 7 15.0	+119
04	258 21.7	194 55.8	30.1	319 12.5	44.3	114 02.1	23.5	17 51.4	25.6	252 23.5	120	7 26.9	+119
05	273 24.2	209 55.6	30.7	334 13.2	44.0	129 04.6	23.5	32 53.9	25.6	266 54.5	119	7 38.8	+119
06	288 26.6	224 55.4	+24 31.3	349 14.0	−21 43.8	144 07.1	+15 23.5	47 56.5	−18 25.6	281 25.4	118	+ 7 50.7	+118
07	303 29.1	239 55.2	31.9	4 14.7	43.5	159 09.6	23.5	62 59.1	25.5	295 56.2	118	8 02.5	+118
08	318 31.6	254 55.0	32.4	19 15.5	43.3	174 12.1	23.6	78 01.7	25.5	310 27.0	117	8 14.3	+118
09	333 34.0	269 54.8	·· 33.0	34 16.2	·· 43.0	189 14.7	·· 23.6	93 04.3	·· 25.5	324 57.7	117	· 8 26.1	+117
10	348 36.5	284 54.6	33.6	49 17.0	42.8	204 17.2	23.6	108 06.8	25.4	339 28.4	116	8 37.8	+118
11	3 39.0	299 54.4	34.2	64 17.7	42.5	219 19.7	23.6	123 09.4	25.4	353 59.0	115	8 49.6	+116
12	18 41.4	314 54.2	+24 34.7	79 18.5	−21 42.3	234 22.2	+15 23.6	138 12.0	−18 25.4	8 29.5	115	+ 9 01.2	+117
13	33 43.9	329 54.0	35.3	94 19.2	42.0	249 24.7	23.6	153 14.6	25.4	23 00.0	114	9 12.9	+116
14	48 46.4	344 53.8	35.9	109 20.0	41.7	264 27.3	23.6	168 17.2	25.3	37 30.4	113	9 24.5	+116
15	63 48.8	359 53.6	·· 36.5	124 20.8	·· 41.5	279 29.8	·· 23.7	183 19.8	·· 25.3	52 00.7	113	· 9 36.1	+115
16	78 51.3	14 53.5	37.0	139 21.5	41.2	294 32.3	23.7	198 22.3	25.3	66 31.0	112	9 47.6	+115
17	93 53.7	29 53.3	37.6	154 22.3	41.0	309 34.8	23.7	213 24.9	25.3	81 01.2	111	9 59.1	+114
18	108 56.2	44 53.1	+24 38.2	169 23.0	−21 40.7	324 37.3	+15 23.7	228 27.5	−18 25.2	95 31.3	111	+10 10.5	+114
19	123 58.7	59 52.9	38.7	184 23.8	40.5	339 39.9	23.7	243 30.1	25.2	110 01.4	110	10 21.9	+114
20	139 01.1	74 52.7	39.3	199 24.5	40.2	354 42.4	23.7	258 32.7	25.2	124 31.4	109	10 33.3	+113
21	154 03.6	89 52.5	·· 39.9	214 25.3	·· 40.0	9 44.9	·· 23.7	273 35.2	·· 25.2	139 01.3	108	· 10 44.6	+113
22	169 06.1	104 52.3	40.4	229 26.0	39.7	24 47.4	23.7	288 37.8	25.1	153 31.1	108	10 55.9	+112
23	184 08.5	119 52.1	41.0	244 26.8	39.5	39 49.9	23.8	303 40.4	25.1	168 00.9	107	11 07.1	+112
11 00	199 11.0	134 51.9	+24 41.5	259 27.6	−21 39.2	54 52.4	+15 23.8	318 43.0	−18 25.1	182 30.6	107	+11 18.3	+111
01	214 13.5	149 51.7	42.1	274 28.3	39.0	69 55.0	23.8	333 45.6	25.0	197 00.3	105	11 29.4	+111
02	229 15.9	164 51.6	42.7	289 29.1	38.7	84 57.5	23.8	348 48.2	25.0	211 29.8	105	11 40.5	+110
03	244 18.4	179 51.4	·· 43.2	304 29.8	·· 38.5	100 00.0	·· 23.8	3 50.7	·· 25.0	225 59.3	105	· 11 51.5	+110
04	259 20.9	194 51.2	43.8	319 30.6	38.2	115 02.5	23.8	18 53.3	25.0	240 28.8	103	12 02.5	+109
05	274 23.3	209 51.0	44.3	334 31.3	37.9	130 05.0	23.8	33 55.9	24.9	254 58.1	103	12 13.4	+108
06	289 25.8	224 50.8	+24 44.9	349 32.1	−21 37.7	145 07.5	+15 23.8	48 58.5	−18 24.9	269 27.4	102	+12 24.2	+108
07	304 28.2	239 50.6	45.5	4 32.9	37.4	160 10.0	23.8	64 01.1	24.9	283 56.6	101	12 35.0	+107
08	319 30.7	254 50.4	46.0	19 33.6	37.2	175 12.6	23.9	79 03.7	24.8	298 25.7	101	12 45.7	+107
09	334 33.2	269 50.2	·· 46.6	34 34.4	·· 36.9	190 15.1	·· 23.9	94 06.2	·· 24.8	312 54.8	99	· 12 56.4	+106
10	349 35.6	284 50.1	47.1	49 35.1	36.7	205 17.6	23.9	109 08.8	24.8	327 23.7	99	13 07.0	+106
11	4 38.1	299 49.9	47.7	64 35.9	36.4	220 20.1	23.9	124 11.4	24.8	341 52.6	99	13 17.6	+104
12	19 40.6	314 49.7	+24 48.2	79 36.7	−21 36.2	235 22.6	+15 23.9	139 14.0	−18 24.7	356 21.5	97	+13 28.0	+104
13	34 43.0	329 49.5	48.8	94 37.4	35.9	250 25.1	23.9	154 16.6	24.7	10 50.2	97	13 38.4	+104
14	49 45.5	344 49.3	49.3	109 38.2	35.6	265 27.6	23.9	169 19.2	24.7	25 18.9	96	13 48.8	+103
15	64 48.0	359 49.1	·· 49.9	124 38.9	·· 35.4	280 30.2	·· 23.9	184 21.8	·· 24.7	39 47.5	95	· 13 59.1	+102
16	79 50.4	14 49.0	50.4	139 39.7	35.1	295 32.7	23.9	199 24.3	24.6	54 16.0	95	14 09.3	+101
17	94 52.9	29 48.8	51.0	154 40.5	34.9	310 35.2	24.0	214 26.9	24.6	68 44.5	93	14 19.4	+101
18	109 55.4	44 48.6	+24 51.5	169 41.2	−21 34.6	325 37.7	+15 24.0	229 29.5	−18 24.6	83 12.8	93	+14 29.5	+ 99
19	124 57.8	59 48.4	52.0	184 42.0	34.3	340 40.2	24.0	244 32.1	24.5	97 41.1	92	14 39.4	+ 99
20	140 00.3	74 48.2	52.6	199 42.7	34.1	355 42.7	24.0	259 34.7	24.5	112 09.3	92	14 49.3	+ 99
21	155 02.7	89 48.1	·· 53.1	214 43.5	·· 33.8	10 45.2	·· 24.0	274 37.3	·· 24.5	126 37.5	90	· 14 59.2	+ 97
22	170 05.2	104 47.9	53.7	229 44.3	33.6	25 47.7	24.0	289 39.9	24.5	141 05.5	90	15 08.9	+ 97
23	185 07.7	119 47.7	54.2	244 45.0	33.3	40 50.2	24.0	304 42.4	24.4	155 33.5	89	15 18.6	+ 96
24	200 10.1	134 47.5	+24 54.7	259 45.8	−21 33.1	55 52.7	+15 24.0	319 45.0	−18 24.4	170 01.4	89	+15 28.2	+ 95
code	—	− 2	+ 6	+ 7	+ 3	+ 25	0	+ 26	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
9 00	179 34.4	+ 7 29.2	7	Acamar	315 51.2	−40 28.9
01	194 34.5	30.2	5	Achernar	335 59.1	−57 27.5
02	209 34.7	31.1	30	Acrux	173 56.7	−62 51.7
03	224 34.9	·· 32.0	19	Adhara	255 46.3	−28 55.0
04	239 35.0	32.9	10	Aldebaran	291 38.8	+16 25.3
05	254 35.2	33.9				
06	269 35.4	+ 7 34.8	32	Alioth	166 57.6	+56 11.7
07	284 35.6	35.7	34	Alkaid	153 32.1	+49 31.7
08	299 35.7	36.7	55	Al Na'ir	28 37.7	−47 10.2
09	314 35.9	·· 37.6	15	Alnilam	276 30.0	− 1 13.9
10	329 36.1	38.5	25	Alphard	218 38.0	− 8 28.4
11	344 36.2	39.5				
12	359 36.4	+ 7 40.4	41	Alphecca	126 47.0	+26 51.4
13	14 36.6	41.3	1	Alpheratz	358 28.2	+28 50.9
14	29 36.8	42.2	51	Altair	62 50.1	+ 8 45.0
15	44 36.9	·· 43.2	2	Ankaa	353 58.3	−42 32.5
16	59 37.1	44.1	42	Antares	113 18.6	−26 20.2
17	74 37.3	45.0				
18	89 37.4	+ 7 45.9	37	Arcturus	146 34.5	+19 24.4
19	104 37.6	46.9	43	Atria	108 58.6	−68 56.8
20	119 37.8	47.8	22	Avior	234 35.5	−59 22.5
21	134 37.9	·· 48.7	13	Bellatrix	279 18.2	+ 6 18.6
22	149 38.1	49.7	16	Betelg'se	271 47.8	+ 7 23.9
23	164 38.3	50.6				
			17	Canopus	264 15.3	−52 40.6
10 00	179 38.4	+ 7 51.5	12	Capella	281 38.1	+45 57.4
01	194 38.6	52.4	53	Deneb	50 00.8	+45 07.2
02	209 38.8	53.4	28	Denebola	183 17.0	+14 48.8
03	224 39.0	·· 54.3	4	Diphda	349 39.2	−18 13.6
04	239 39.1	55.2				
05	254 39.3	56.1	27	Dubhe	194 43.6	+61 59.2
06	269 39.5	+ 7 57.1	14	Elnath	279 07.0	+28 34.3
07	284 39.6	58.0	47	Eltanin	91 05.9	+51 29.3
08	299 39.8	58.9	54	Enif	34 29.4	+ 9 40.4
09	314 40.0	· 7 59.8	56	Fomalhaut	16 11.5	−29 51.2
10	329 40.1	8 00.8				
11	344 40.3	01.7	31	Gacrux	172 48.2	−56 52.3
12	359 40.5	+ 8 02.6	29	Gienah	176 36.1	−17 18.2
13	14 40.6	03.5	35	Hadar	149 48.2	−60 09.9
14	29 40.8	04.4	6	Hamal	328 49.5	+23 15.4
15	44 41.0	·· 05.4	48	Kaus Aust.	84 40.5	−34 24.3
16	59 41.1	06.3				
17	74 41.3	07.2	40	Kochab	137 16.9	+74 19.9
18	89 41.5	+ 8 08.1	57	Markab	14 21.3	+14 58.1
19	104 41.6	09.1	8	Menkar	315 00.2	+ 3 55.1
20	119 41.8	10.0	36	Menkent	148 57.8	−36 09.5
21	134 42.0	·· 10.9	24	Miapl'dus	221 48.5	−69 32.6
22	149 42.1	11.8				
23	164 42.3	12.7	9	Mirfak	309 42.2	+49 42.5
			50	Nunki	76 51.3	−26 21.1
11 00	179 42.5	+ 8 13.7	52	Peacock	54 26.8	−56 52.3
01	194 42.6	14.6	21	Pollux	244 20.1	+28 08.0
02	209 42.8	15.5	20	Procyon	245 44.6	+ 5 20.1
03	224 43.0	·· 16.4				
04	239 43.1	17.3	46	R'alhague	96 46.1	+12 35.3
05	254 43.3	18.3	26	Regulus	208 28.9	+12 10.7
06	269 43.5	+ 8 19.2	11	Rigel	281 53.4	− 8 15.2
07	284 43.6	20.1	38	Rigil Kent.	140 49.8	−60 39.4
08	299 43.8	21.0	44	Sabik	103 01.5	−15 40.4
09	314 44.0	·· 21.9				
10	329 44.1	22.8	3	Schedar	350 30.1	+56 17.8
11	344 44.3	23.8	45	Shaula	97 19.9	−37 04.3
12	359 44.5	+ 8 24.7	18	Sirius	259 11.6	−16 39.6
13	14 44.6	25.6	33	Spica	159 16.1	−10 56.2
14	29 44.8	26.5	23	Suhail	223 23.8	−43 15.7
15	44 45.0	·· 27.4				
16	59 45.1	28.4	49	Vega	81 07.9	+38 44.3
17	74 45.3	29.3	39	Zub'g'bi	137 52.6	−15 51.8
18	89 45.4	+ 8 30.2				
19	104 45.6	31.1				
20	119 45.8	32.0				
21	134 45.9	·· 32.9				
22	149 46.1	33.8				
23	164 46.3	34.8				
24	179 46.4	+ 8 35.7				
code	—	+ 9				

Lat.	Sunrise	Twlt. begins	Moonrise 9	10	11	12
N °	h m	h m	h m	h m	h m	h m
72	4 07	////	3 54	3 38	3 17	2 45
70	4 20	////	3 58	3 48	3 37	3 22
68	4 31	////	4 00	3 56	3 52	3 49
66	4 39	////	4 03	4 04	4 05	4 09
64	4 47	0 26	4 05	4 10	4 16	4 25
62	4 53	1 33	4 06	4 15	4 25	4 39
60	4 58	2 04	4 08	4 19	4 33	4 51
58	5 03	2 27	4 09	4 24	4 40	5 01
56	5 07	2 44	4 11	4 27	4 46	5 10
54	5 11	2 59	4 12	4 30	4 52	5 18
52	5 15	3 11	4 13	4 33	4 57	5 25
50	5 18	3 21	4 14	4 36	5 01	5 31
45	5 24	3 41	4 16	4 42	5 11	5 45
40	5 30	3 57	4 17	4 47	5 19	5 56
35	5 35	4 08	4 19	4 51	5 27	6 06
30	5 39	4 18	4 20	4 55	5 33	6 15
20	5 46	4 32	4 22	5 02	5 44	6 30
10	5 52	4 42	4 24	5 08	5 54	6 43
0	5 58	4 49	4 26	5 13	6 03	6 55
10	6 04	4 54	4 28	5 19	6 12	7 08
20	6 09	4 56	4 30	5 25	6 22	7 21
30	6 16	4 56	4 33	5 32	6 34	7 37
35	6 20	4 55	4 34	5 36	6 40	7 46
40	6 24	4 53	4 36	5 41	6 48	7 56
45	6 29	4 51	4 38	5 46	6 57	8 08
50	6 35	4 46	4 40	5 53	7 07	8 23
52	6 37	4 43	4 41	5 56	7 12	8 30
54	6 40	4 40	4 42	5 59	7 18	8 38
56	6 43	4 37	4 44	6 03	7 24	8 47
58	6 47	4 34	4 45	6 07	7 31	8 56
60	6 51	4 29	4 47	6 11	7 39	9 08
S						

Lat.	Sunset	Twlt. ends	Moonset 9	10	11	12
N °	h m	h m	h m	h m	h m	h m
72	19 59	////	17 58	20 00	22 20	□
70	19 45	////	17 50	19 42	21 44	24 07
68	19 34	////	17 43	19 28	21 19	23 17
66	19 25	////	17 38	19 17	21 00	22 45
64	19 18	////	17 34	19 07	20 44	22 22
62	19 11	22 39	17 30	18 59	20 31	22 04
60	19 06	22 06	17 26	18 52	20 20	21 49
58	19 01	21 42	17 23	18 46	20 11	21 36
56	18 57	21 24	17 21	18 41	20 03	21 25
54	18 53	21 09	17 18	18 36	19 56	21 15
52	18 49	20 56	17 16	18 32	19 49	21 07
50	18 46	20 46	17 14	18 28	19 43	20 59
45	18 39	20 25	17 10	18 19	19 31	20 42
40	18 33	20 08	17 07	18 12	19 20	20 29
35	18 28	19 56	17 04	18 06	19 11	20 18
30	18 24	19 46	17 01	18 01	19 03	20 08
20	18 17	19 32	16 56	17 52	18 50	19 50
10	18 10	19 21	16 52	17 44	18 38	19 36
0	18 05	19 14	16 49	17 37	18 28	19 22
10	17 59	19 09	16 45	17 29	18 17	19 08
20	17 53	19 06	16 41	17 21	18 05	18 53
30	17 46	19 06	16 36	17 12	17 52	18 36
35	17 42	19 06	16 33	17 07	17 44	18 27
40	17 38	19 08	16 30	17 01	17 36	18 15
45	17 33	19 10	16 27	16 54	17 26	18 02
50	17 27	19 14	16 23	16 46	17 14	17 46
52	17 24	19 16	16 21	16 43	17 08	17 39
54	17 22	19 20	16 19	16 39	17 02	17 31
56	17 18	19 22	16 17	16 34	16 55	17 21
58	17 15	19 26	16 14	16 29	16 47	17 11
60	17 11	19 30	16 11	16 23	16 39	16 59
S						

GMT	Equation of Time (App. − Mean) 9	10	11
h	m s	m s	m s
0	− 1 42.9	− 1 26.5	− 1 10.4
6	− 1 38.8	− 1 22.5	− 1 06.5
12	− 1 34.7	− 1 18.5	− 1 02.5
18	− 1 30.6	− 1 14.4	− 0 58.6
24	− 1 26.5	− 1 10.4	− 0 54.6

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
9	10 37	15 00	6 44	20 25	2 53
10	11 25	15 00	6 43	20 21	2 49
11	12 15	15 01	6 42	20 17	2 45
12	13 09	15 01	6 41	20 13	2 41

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.3	0.2	0.1
30	0.3	0.2	0.1
45	0.3	0.1	0.1
60	0.3	0.1	0.0
75	0.3	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	9	10	11
°	′	′	′
0	15.4	16.3	17.1
4	15.4	16.3	17.1
8	15.4	16.3	17.1
12	15.4	16.3	17.0
16	15.4	16.3	17.0
20	15.4	16.3	17.0
24	15.4	16.3	17.0
28	15.4	16.2	16.9
32	15.4	16.2	16.9
36	15.4	16.2	16.8
40	15.4	16.2	16.8
44	15.5	16.1	16.7
48	15.5	16.1	16.6
52	15.5	16.1	16.6
56	15.5	16.0	16.5
60	15.5	16.0	16.4
64	15.5	16.0	16.4
68	15.5	15.9	16.3
72	15.5	15.9	16.2
76	15.5	15.8	16.1
80	15.5	15.8	16.0
84	15.5	15.8	16.0
88	15.5	15.7	15.9
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	9	10	11
°	′	′	′
0	15.6	15.1	14.7
4	15.6	15.1	14.7
8	15.6	15.1	14.7
12	15.6	15.1	14.7
16	15.6	15.1	14.7
20	15.6	15.2	14.8
24	15.6	15.2	14.8
28	15.6	15.2	14.8
32	15.6	15.2	14.9
36	15.6	15.2	14.9
40	15.6	15.3	15.0
44	15.6	15.3	15.0
48	15.6	15.3	15.1
52	15.6	15.4	15.2
56	15.6	15.4	15.2
60	15.6	15.4	15.3
64	15.6	15.5	15.4
68	15.6	15.5	15.5
72	15.6	15.5	15.5
76	15.5	15.6	15.6
80	15.5	15.6	15.7
84	15.5	15.7	15.8
88	15.5	15.7	15.9
90			

Subtract from table, back cover

New Moon 11

GMT	♈ GHA	VENUS −4.0 GHA	VENUS −4.0 Dec	MARS 0.6 GHA	MARS 0.6 Dec.	JUPITER −1.8 GHA	JUPITER −1.8 Dec.	SATURN 0.4 GHA	SATURN 0.4 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
12 0	200 10.1	134 47.5	+24 54.7	259 45.8	−21 33.1	55 52.7	+15 24.0	319 45.0	−18 24.4	170 01.4	89	+15 28.2	+ 95
1	215 12.6	149 47.3	55.3	274 46.5	32.8	70 55.2	24.0	334 47.6	24.4	184 29.3	87	15 37.7	+ 94
2	230 15.1	164 47.2	55.8	289 47.3	32.5	85 57.8	24.0	349 50.2	24.4	198 57.0	87	15 47.1	+ 93
3	245 17.5	179 47.0	·· 56.4	304 48.1	·· 32.3	101 00.3	·· 24.1	4 52.8	·· 24.3	213 24.7	86	·15 56.4	+ 93
4	260 20.0	194 46.8	56.9	319 48.8	32.0	116 02.8	24.1	19 55.4	24.3	227 52.3	85	16 05.7	+ 91
5	275 22.5	209 46.6	57.4	334 49.6	31.7	131 05.3	24.1	34 58.0	24.3	242 19.8	84	·16 14.8	+ 91
6	290 24.9	224 46.5	+24 58.0	349 50.3	−21 31.5	146 07.8	+15 24.1	50 00.6	−18 24.2	256 47.2	84	+16 23.9	+ 90
7	305 27.4	239 46.3	58.5	4 51.1	31.2	161 10.3	24.1	65 03.1	24.2	271 14.6	83	16 32.9	+ 89
8	320 29.8	254 46.1	59.0	19 51.9	31.0	176 12.8	24.1	80 05.7	24.2	285 41.9	82	16 41.8	+ 87
9	335 32.3	269 45.9	·24 59.6	34 52.6	·· 30.7	191 15.3	·· 24.1	95 08.3	·· 24.2	300 09.1	81	·16 50.5	+ 87
10	350 34.8	284 45.7	25 00.1	49 53.4	30.4	206 17.8	24.1	110 10.9	24.1	314 36.2	81	16 59.2	+ 86
11	5 37.2	299 45.6	00.6	64 54.2	30.2	221 20.3	24.1	125 13.5	24.1	329 03.3	80	17 07.8	+ 85
12	20 39.7	314 45.4	+25 01.1	79 54.9	−21 29.9	236 22.8	+15 24.1	140 16.1	−18 24.1	343 30.3	79	+17 16.3	+ 84
13	35 42.2	329 45.2	01.7	94 55.7	29.7	251 25.3	24.1	155 18.7	24.0	357 57.2	78	17 24.7	+ 83
14	50 44.6	344 45.1	02.2	109 56.4	29.4	266 27.8	24.1	170 21.3	24.0	12 24.0	78	17 33.0	+ 82
15	65 47.1	359 44.9	·· 02.7	124 57.2	·· 29.1	281 30.3	·· 24.2	185 23.8	·· 24.0	26 50.8	77	·17 41.2	+ 81
16	80 49.6	14 44.7	03.2	139 58.0	28.9	296 32.8	24.2	200 26.4	24.0	41 17.5	76	17 49.3	+ 80
17	95 52.0	29 44.5	03.8	154 58.7	28.6	311 35.3	24.2	215 29.0	23.9	55 44.1	75	17 57.3	+ 79
18	110 54.5	44 44.4	+25 04.3	169 59.5	−21 28.3	326 37.8	+15 24.2	230 31.6	−18 23.9	70 10.6	75	+18 05.2	+ 78
19	125 57.0	59 44.2	04.8	185 00.3	28.1	341 40.3	24.2	245 34.2	23.9	84 37.1	74	18 13.0	+ 76
20	140 59.4	74 44.0	05.3	200 01.0	27.8	356 42.8	24.2	260 36.8	23.8	99 03.5	73	18 20.6	+ 76
21	156 01.9	89 43.9	·· 05.9	215 01.8	·· 27.5	11 45.3	·· 24.2	275 39.4	·· 23.8	113 29.8	73	·18 28.2	+ 75
22	171 04.3	104 43.7	06.4	230 02.6	27.3	26 47.9	24.2	290 42.0	23.8	127 56.1	71	18 35.7	+ 73
23	186 06.8	119 43.5	06.9	245 03.3	27.0	41 50.4	24.2	305 44.6	23.8	142 22.2	71	18 43.0	+ 72
13 0	201 09.3	134 43.4	+25 07.4	260 04.1	−21 26.7	56 52.9	+15 24.2	320 47.2	−18 23.7	156 48.3	71	+18 50.2	+ 71
1	216 11.7	149 43.2	07.9	275 04.9	26.5	71 55.4	24.2	335 49.7	23.7	171 14.4	69	18 57.3	+ 70
2	231 14.2	164 43.0	08.4	290 05.6	26.2	86 57.9	24.2	350 52.3	23.7	185 40.3	69	19 04.3	+ 69
3	246 16.7	179 42.8	·· 08.9	305 06.4	·· 26.0	102 00.4	·· 24.2	5 54.9	·· 23.6	200 06.2	69	·19 11.2	+ 67
4	261 19.1	194 42.7	09.5	320 07.2	25.7	117 02.9	24.2	20 57.5	23.6	214 32.1	68	19 17.9	+ 67
5	276 21.6	209 42.5	10.0	335 07.9	25.4	132 05.4	24.3	36 00.1	23.6	228 57.9	67	19 24.6	+ 65
6	291 24.1	224 42.4	+25 10.5	350 08.7	−21 25.2	147 07.9	+15 24.3	51 02.7	−18 23.6	243 23.6	66	+19 31.1	+ 64
7	306 26.5	239 42.2	11.0	5 09.5	24.9	162 10.4	24.3	66 05.3	23.5	257 49.2	66	19 37.5	+ 63
8	321 29.0	254 42.0	11.5	20 10.2	24.6	177 12.9	24.3	81 07.9	23.5	272 14.8	65	19 43.8	+ 61
9	336 31.4	269 41.9	·· 12.0	35 11.0	·· 24.4	192 15.3	·· 24.3	96 10.5	·· 23.5	286 40.3	64	·19 49.9	+ 60
10	351 33.9	284 41.7	12.5	50 11.8	24.1	207 17.8	24.3	111 13.1	23.4	301 05.7	64	19 55.9	+ 59
11	6 36.4	299 41.5	13.0	65 12.5	23.8	222 20.3	24.3	126 15.6	23.4	315 31.1	63	20 01.8	+ 58
12	21 38.8	314 41.4	+25 13.5	80 13.3	−21 23.5	237 22.8	+15 24.3	141 18.2	−18 23.4	329 56.4	63	+20 07.6	+ 56
13	36 41.3	329 41.2	14.0	95 14.1	23.3	252 25.3	24.3	156 20.8	23.4	344 21.7	62	20 13.2	+ 56
14	51 43.8	344 41.0	14.5	110 14.8	23.0	267 27.8	24.3	171 23.4	23.3	358 46.9	62	20 18.8	+ 53
15	66 46.2	359 40.9	·· 15.0	125 15.6	·· 22.7	282 30.3	·· 24.3	186 26.0	·· 23.3	13 12.1	61	·20 24.1	+ 53
16	81 48.7	14 40.7	15.5	140 16.4	22.5	297 32.8	24.3	201 28.6	23.3	27 37.2	60	20 29.4	+ 51
17	96 51.2	29 40.6	16.0	155 17.1	22.2	312 35.3	24.3	216 31.2	23.2	42 02.2	60	20 34.5	+ 50
18	111 53.6	44 40.4	+25 16.5	170 17.9	−21 21.9	327 37.8	+15 24.3	231 33.8	−18 23.2	56 27.2	59	+20 39.5	+ 49
19	126 56.1	59 40.2	17.0	185 18.7	21.7	342 40.3	24.3	246 36.4	23.2	70 52.1	59	20 44.4	+ 47
20	141 58.6	74 40.1	17.5	200 19.4	21.4	357 42.8	24.3	261 39.0	23.2	85 17.0	59	20 49.1	+ 46
21	157 01.0	89 39.9	·· 18.0	215 20.2	·· 21.1	12 45.3	·· 24.3	276 41.6	·· 23.1	99 41.9	57	·20 53.7	+ 44
22	172 03.5	104 39.8	18.5	230 21.0	20.9	27 47.8	24.3	291 44.2	23.1	114 06.6	58	20 58.1	+ 43
23	187 05.9	119 39.6	19.0	245 21.7	20.6	42 50.3	24.3	306 46.8	23.1	128 31.4	57	21 02.4	+ 42
14 0	202 08.4	134 39.5	+25 19.5	260 22.5	−21 20.3	57 52.8	+15 24.4	321 49.3	−18 23.0	142 56.1	56	+21 06.6	+ 40
1	217 10.9	149 39.3	20.0	275 23.3	20.0	72 55.3	24.4	336 51.9	23.0	157 20.7	56	21 10.6	+ 39
2	232 13.3	164 39.1	20.5	290 24.0	19.8	87 57.8	24.4	351 54.5	23.0	171 45.3	56	21 14.5	+ 38
3	247 15.8	179 39.0	·· 21.0	305 24.8	·· 19.5	103 00.3	·· 24.4	6 57.1	·· 23.0	186 09.9	55	·21 18.3	+ 36
4	262 18.3	194 38.8	21.5	320 25.6	19.2	118 02.7	24.4	21 59.7	22.9	200 34.4	55	21 21.9	+ 35
5	277 20.7	209 38.7	22.0	335 26.4	19.0	133 05.2	24.4	37 02.3	22.9	214 58.9	54	21 25.4	+ 33
6	292 23.2	224 38.5	+25 22.4	350 27.1	−21 18.7	148 07.7	+15 24.4	52 04.9	−18 22.9	229 23.3	54	+21 28.7	+ 32
7	307 25.7	239 38.4	22.9	5 27.9	18.4	163 10.2	24.4	67 07.5	22.8	243 47.7	54	21 31.9	+ 30
8	322 28.1	254 38.2	23.4	20 28.7	18.1	178 12.7	24.4	82 10.1	22.8	258 12.1	53	21 34.9	+ 29
9	337 30.6	269 38.1	·· 23.9	35 29.4	·· 17.9	193 15.2	·· 24.4	97 12.7	·· 22.8	272 36.4	53	·21 37.8	+ 28
10	352 33.1	284 37.9	24.4	50 30.2	17.6	208 17.7	24.4	112 15.3	22.8	287 00.7	53	21 40.6	+ 26
11	7 35.5	299 37.8	24.9	65 31.0	17.3	223 20.2	24.4	127 17.9	22.7	301 25.0	52	21 43.2	+ 25
12	22 38.0	314 37.6	+25 25.4	80 31.8	−21 17.0	238 22.7	+15 24.4	142 20.5	−18 22.7	315 49.2	53	+21 45.7	+ 23
13	37 40.4	329 37.5	25.8	95 32.5	16.8	253 25.2	24.4	157 23.1	22.7	330 13.5	51	21 48.0	+ 21
14	52 42.9	344 37.3	26.3	110 33.3	16.5	268 27.7	24.4	172 25.7	22.6	344 37.6	52	21 50.1	+ 21
15	67 45.4	359 37.2	·· 26.8	125 34.1	·· 16.2	283 30.1	·· 24.4	187 28.3	·· 22.6	359 01.8	52	·21 52.2	+ 18
16	82 47.8	14 37.0	27.3	140 34.8	16.0	298 32.6	24.4	202 30.9	22.6	13 26.0	51	21 54.0	+ 18
17	97 50.3	29 36.9	27.7	155 35.6	15.7	313 35.1	24.4	217 33.5	22.5	27 50.1	51	21 55.8	+ 15
18	112 52.8	44 36.7	+25 28.2	170 36.4	−21 15.4	328 37.6	+15 24.4	232 36.0	−18 22.5	42 14.2	51	+21 57.3	+ 15
19	127 55.2	59 36.6	28.7	185 37.2	15.1	343 40.1	24.4	247 38.6	22.5	56 38.3	50	21 58.8	+ 13
20	142 57.7	74 36.4	29.2	200 37.9	14.9	358 42.6	24.4	262 41.2	22.5	71 02.3	51	22 00.1	+ 11
21	158 00.2	89 36.3	·· 29.6	215 38.7	·· 14.6	13 45.1	·· 24.4	277 43.8	·· 22.4	85 26.4	50	·22 01.2	+ 10
22	173 02.6	104 36.2	30.1	230 39.5	14.3	28 47.6	24.4	292 46.4	22.4	99 50.4	50	22 02.2	+ 8
23	188 05.1	119 36.0	30.6	245 40.3	14.0	43 50.0	24.4	307 49.0	22.4	114 14.4	50	22 03.0	+ 7
24	203 07.6	134 35.9	+25 31.1	260 41.0	−21 13.8	58 52.5	+15 24.4	322 51.6	−18 22.3	128 38.4	51	+22 03.7	+ 5
code	−	− 2	+ 5	+ 8	+ 2	+ 25	0	+ 26	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
12 00	179 46.4	+ 8 35.7
01	194 46.6	36.6
02	209 46.8	37.5
03	224 46.9	•• 38.4
04	239 47.1	39.3
05	254 47.2	40.2
06	269 47.4	+ 8 41.2
07	284 47.6	42.1
08	299 47.7	43.0
09	314 47.9	•• 43.9
10	329 48.1	44.8
11	344 48.2	45.7
12	359 48.4	+ 8 46.6
13	14 48.5	47.5
14	29 48.7	48.4
15	44 48.9	•• 49.4
16	59 49.0	50.3
17	74 49.2	51.2
18	89 49.3	+ 8 52.1
19	104 49.5	53.0
20	119 49.7	53.9
21	134 49.8	•• 54.8
22	149 50.0	55.7
23	164 50.1	56.6
13 00	179 50.3	+ 8 57.5
01	194 50.5	58.5
02	209 50.6	8 59.4
03	224 50.8	• 9 00.3
04	239 50.9	01.2
05	254 51.1	02.1
06	269 51.3	+ 9 03.0
07	284 51.4	03.9
08	299 51.6	04.8
09	314 51.7	•• 05.7
10	329 51.9	06.6
11	344 52.1	07.5
12	359 52.2	+ 9 08.4
13	14 52.4	09.3
14	29 52.5	10.2
15	44 52.7	•• 11.1
16	59 52.8	12.0
17	74 53.0	12.9
18	89 53.2	+ 9 13.8
19	104 53.3	14.8
20	119 53.5	15.7
21	134 53.6	•• 16.6
22	149 53.8	17.5
23	164 53.9	18.4
14 00	179 54.1	+ 9 19.3
01	194 54.3	20.2
02	209 54.4	21.1
03	224 54.6	•• 22.0
04	239 54.7	22.9
05	254 54.9	23.8
06	269 55.0	+ 9 24.7
07	284 55.2	25.6
08	299 55.3	26.5
09	314 55.5	•• 27.4
10	329 55.7	28.3
11	344 55.8	29.2
12	359 56.0	+ 9 30.1
13	14 56.1	31.0
14	29 56.3	31.9
15	44 56.4	•• 32.8
16	59 56.6	33.7
17	74 56.7	34.6
18	89 56.9	+ 9 35.5
19	104 57.1	36.3
20	119 57.2	37.2
21	134 57.4	•• 38.1
22	149 57.5	39.0
23	164 57.7	39.9
24	179 57.8	+ 9 40.8
code	—	+ 9

No.	Name	STARS SHA	STARS Dec.
		° ′	° ′
7	Acamar	315 51.2	−40 28.9
5	Achernar	335 59.1	−57 27.5
30	Acrux	173 56.7	−62 51.7
19	Adhara	255 46.3	−28 55.0
10	Aldebaran	291 38.8	+16 25.3
32	Alioth	166 57.6	+56 11.7
34	Alkaid	153 32.1	+49 31.7
55	Al Na'ir	28 37.7	−47 10.2
15	Alnilam	276 30.0	− 1 13.9
25	Alphard	218 38.1	− 8 28.4
41	Alphecca	126 47.0	+26 51.4
1	Alpheratz	358 28.2	+28 50.9
51	Altair	62 50.0	+ 8 45.0
2	Ankaa	353 58.3	−42 32.5
42	Antares	113 18.6	−26 20.2
37	Arcturus	146 34.5	+19 24.4
43	Atria	108 58.6	−68 56.9
22	Avior	234 35.5	−59 22.5
13	Bellatrix	279 18.2	+ 6 18.6
16	Betelg'se	271 47.8	+ 7 23.9
17	Canopus	264 15.4	−52 40.6
12	Capella	281 38.1	+45 57.4
53	Deneb	50 00.8	+45 07.2
28	Denebola	183 17.0	+14 48.8
4	Diphda	349 39.2	−18 13.6
27	Dubhe	194 43.6	+61 59.3
14	Elnath	279 07.0	+28 34.3
47	Eltanin	91 05.8	+51 29.3
54	Enif	34 29.4	+ 9 40.4
56	Fomalhaut	16 11.4	−29 51.1
31	Gacrux	172 48.2	−56 52.4
29	Gienah	176 36.1	−17 18.2
35	Hadar	149 48.2	−60 09.9
6	Hamal	328 49.5	+23 15.4
48	Kaus Aust.	84 40.5	−34 24.3
40	Kochab	137 16.9	+74 19.9
57	Markab	14 21.3	+14 58.1
8	Menkar	315 00.2	+ 3 55.1
36	Menkent	148 57.8	−36 09.5
24	Miapl'dus	221 48.6	−69 32.6
9	Mirfak	309 42.2	+49 42.5
50	Nunki	76 51.3	−26 21.1
52	Peacock	54 26.7	−56 52.3
21	Pollux	244 20.1	+28 08.0
20	Procyon	245 44.6	+ 5 20.1
46	R'alhague	96 46.1	+12 35.3
26	Regulus	208 28.9	+12 10.7
11	Rigel	281 53.4	− 8 15.2
38	Rigil Kent.	140 49.8	−60 39.5
44	Sabik	103 01.5	−15 40.4
3	Schedar	350 30.0	+56 17.8
45	Shaula	97 19.9	−37 04.3
18	Sirius	259 11.6	−16 39.5
33	Spica	159 16.1	−10 56.2
23	Suhail	223 23.9	−43 15.7
49	Vega	81 07.9	+38 44.3
39	Zub'g'bi	137 52.6	−15 51.8

GMT	Equation of Time (App.—Mean) 12	13	14
h	m s	m s	m s
0	− 0 54.6	− 0 39.1	− 0 23.9
6	− 0 50.7	− 0 35.3	− 0 20.2
12	− 0 46.8	− 0 31.5	− 0 16.4
18	− 0 43.0	− 0 27.7	− 0 12.7
24	− 0 39.1	− 0 23.9	− 0 09.0

Lat.	Sunrise	Twlt. begins	Moonrise 12	13	14	15
N °	h m	h m	h m	h m	h m	h m
72	3 51	////	2 45	□	□	□
70	4 06	////	3 22	2 53	□	□
68	4 18	////	3 49	3 45	3 42	3 54
66	4 28	////	4 09	4 17	4 36	5 20
64	4 36	////	4 25	4 41	5 09	5 57
62	4 43	1 04	4 39	5 00	5 33	6 24
60	4 49	1 46	4 51	5 16	5 52	6 45
58	4 55	2 13	5 01	5 29	6 08	7 02
56	5 00	2 32	5 10	5 40	6 22	7 17
54	5 04	2 48	5 18	5 51	6 34	7 29
52	5 08	3 01	5 25	6 00	6 44	7 40
50	5 11	3 12	5 31	6 08	6 54	7 50
45	5 19	3 35	5 45	6 25	7 13	8 11
40	5 25	3 51	5 56	6 39	7 30	8 27
35	5 31	4 03	6 06	6 51	7 43	8 41
30	5 35	4 14	6 15	7 02	7 55	8 53
20	5 44	4 29	6 30	7 20	8 15	9 14
10	5 51	4 40	6 43	7 36	8 33	9 33
0	5 57	4 47	6 55	7 51	8 50	9 50
10	6 04	4 54	7 08	8 07	9 07	10 07
20	6 10	4 56	7 21	8 23	9 25	10 25
30	6 18	4 57	7 37	8 41	9 45	10 46
35	6 22	4 57	7 46	8 52	9 57	10 58
40	6 27	4 56	7 56	9 05	10 11	11 13
45	6 33	4 53	8 08	9 20	10 28	11 30
50	6 39	4 51	8 23	9 38	10 48	11 50
52	6 42	4 49	8 30	9 47	10 58	12 00
54	6 46	4 46	8 38	9 56	11 09	12 11
56	6 49	4 43	8 47	10 07	11 22	12 24
58	6 53	4 40	8 56	10 20	11 36	12 38
60	6 58	4 37	9 08	10 35	11 53	12 56

Lat.	Sunset	Twlt. ends	Moonset 12	13	14	15
N °	h m	h m	h m	h m	h m	h m
72	20 14	////	□	□	□	□
70	19 58	////	24 07	0 07	□	□
68	19 46	////	23 17	25 21	1 21	3 14
66	19 36	////	22 45	24 27	0 27	1 48
64	19 27	////	22 22	23 55	25 11	1 11
62	19 20	23 11	22 04	23 31	24 44	0 44
60	19 13	22 23	21 49	23 12	24 23	0 23
58	19 08	21 55	21 36	22 56	24 06	0 06
56	19 03	21 34	21 25	22 43	23 51	24 47
54	18 58	21 17	21 15	22 31	23 39	24 35
52	18 54	21 04	21 07	22 21	23 28	24 24
50	18 51	20 53	20 59	22 12	23 18	24 15
45	18 43	20 30	20 42	21 52	22 58	23 55
40	18 36	20 12	20 29	21 37	22 41	23 39
35	18 31	20 00	20 18	21 23	22 27	23 25
30	18 26	19 49	20 08	21 12	22 15	23 13
20	18 18	19 33	19 50	20 52	21 54	22 53
10	18 10	19 21	19 36	20 35	21 35	22 35
0	18 04	19 14	19 22	20 19	21 18	22 18
10	17 57	19 07	19 08	20 03	21 01	22 02
20	17 51	19 05	18 53	19 46	20 43	21 44
30	17 43	19 03	18 36	19 26	20 22	21 23
35	17 39	19 03	18 27	19 15	20 10	21 11
40	17 34	19 04	18 15	19 02	19 55	20 57
45	17 28	19 06	18 02	18 46	19 39	20 40
50	17 21	19 08	17 46	18 27	19 18	20 19
52	17 18	19 10	17 39	18 18	19 08	20 10
54	17 15	19 13	17 31	18 08	18 57	19 59
56	17 11	19 15	17 21	17 57	18 44	19 46
58	17 07	19 18	17 11	17 44	18 30	19 32
60	17 02	19 21	16 59	17 29	18 12	19 14

DAY	GMT of Transit Meridian of Greenwich Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
12	13 09	15 01	6 41	20 13	2 41
13	14 05	15 01	6 39	20 09	2 36
14	15 04	15 02	6 38	20 05	2 32
15	16 04	15 02	6 37	20 01	2 28

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.3	0.2	0.1
30	0.3	0.2	0.1
45	0.3	0.1	0.1
60	0.3	0.1	0.0
75	0.3	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	12	13	14
°	′	′	′
0	17.7	18.2	18.5
4	17.7	18.2	18.5
8	17.7	18.2	18.4
12	17.7	18.2	18.4
16	17.6	18.1	18.4
20	17.6	18.1	18.3
24	17.5	18.0	18.2
28	17.5	17.9	18.2
32	17.4	17.9	18.1
36	17.4	17.8	18.0
40	17.3	17.7	17.9
44	17.2	17.6	17.8
48	17.1	17.5	17.7
52	17.0	17.4	17.5
56	16.9	17.2	17.4
60	16.8	17.1	17.3
64	16.7	17.0	17.1
68	16.6	16.8	17.0
72	16.5	16.7	16.8
76	16.4	16.6	16.7
80	16.3	16.4	16.5
84	16.1	16.3	16.3
88	16.0	16.2	16.2
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	12	13	14
°	′	′	′
0	14.3	14.0	13.9
4	14.3	14.0	13.9
8	14.3	14.1	13.9
12	14.4	14.1	13.9
16	14.4	14.1	14.0
20	14.4	14.2	14.0
24	14.5	14.2	14.1
28	14.5	14.3	14.2
32	14.6	14.4	14.3
36	14.7	14.5	14.4
40	14.8	14.6	14.5
44	14.8	14.7	14.6
48	14.9	14.8	14.7
52	15.0	14.9	14.8
56	15.1	15.0	15.0
60	15.2	15.1	15.1
64	15.3	15.3	15.2
68	15.4	15.4	15.4
72	15.5	15.5	15.5
76	15.7	15.7	15.7
80	15.8	15.8	15.9
84	15.9	16.0	16.0
88	16.0	16.1	16.1
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −4.0 GHA	Dec	MARS 0.5 GHA	Dec.	JUPITER −1.8 GHA	Dec.	SATURN 0.4 GHA	Dec.	MOON GHA	code	Dec.	code
	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
15 0	203 07.6	134 35.9	+25 31.1	260 41.0	−21 13.8	58 52.5	+15 24.4	322 51.6	−18 22.3	128 38.4	51	+22 03.7	+ 5
1	218 10.0	149 35.7	31.5	275 41.8	13.5	73 55.0	24.4	337 54.2	22.3	143 02.5	50	22 04.2	+ 4
2	233 12.5	164 35.6	32.0	290 42.6	13.2	88 57.5	24.4	352 56.8	22.3	157 26.5	49	22 04.6	+ 2
3	248 14.9	179 35.4	·· 32.5	305 43.4	·· 12.9	104 00.0	·· 24.4	7 59.4	·· 22.3	171 50.4	50	·22 04.8	+ 1
4	263 17.4	194 35.3	32.9	320 44.1	12.6	119 02.5	24.4	23 02.0	22.2	186 14.4	50	22 04.9	0
5	278 19.9	209 35.2	33.4	335 44.9	12.4	134 04.9	24.4	38 04.6	22.2	200 38.4	50	22 04.9	− 3
6	293 22.3	224 35.0	+25 33.9	350 45.7	−21 12.1	149 07.4	+15 24.4	53 07.2	−18 22.2	215 02.4	50	+22 04.6	− 3
7	308 24.8	239 34.9	34.3	5 46.5	11.8	164 09.9	24.4	68 09.8	22.1	229 26.4	50	22 04.3	− 5
8	323 27.3	254 34.7	34.8	20 47.2	11.5	179 12.4	24.4	83 12.4	22.1	243 50.4	50	22 03.8	− 7
9	338 29.7	269 34.6	·· 35.3	35 48.0	·· 11.3	194 14.9	·· 24.4	98 15.0	·· 22.1	258 14.4	50	·22 03.1	− 8
10	353 32.2	284 34.5	35.7	50 48.8	11.0	209 17.4	24.4	113 17.6	22.0	272 38.4	50	22 02.3	− 10
11	8 34.7	299 34.3	36.2	65 49.6	10.7	224 19.8	24.4	128 20.2	22.0	287 02.4	50	22 01.3	− 11
12	23 37.1	314 34.2	+25 36.6	80 50.3	−21 10.4	239 22.3	+15 24.4	143 22.8	−18 22.0	301 26.4	51	+22 00.2	− 13
13	38 39.6	329 34.1	37.1	95 51.1	10.1	254 24.8	24.4	158 25.4	22.0	315 50.5	50	21 58.9	− 14
14	53 42.0	344 33.9	37.5	110 51.9	09.9	269 27.3	24.4	173 28.0	21.9	330 14.5	50	21 57.5	− 15
15	68 44.5	359 33.8	·· 38.0	125 52.7	·· 09.6	284 29.8	·· 24.4	188 30.6	·· 21.9	344 38.5	51	·21 56.0	− 18
16	83 47.0	14 33.7	38.5	140 53.4	09.3	299 32.2	24.4	203 33.2	21.9	359 02.6	51	21 54.2	− 18
17	98 49.4	29 33.5	38.9	155 54.2	09.0	314 34.7	24.4	218 35.8	21.8	13 26.7	51	21 52.4	− 20
18	113 51.9	44 33.4	+25 39.4	170 55.0	−21 08.7	329 37.2	+15 24.4	233 38.4	−18 21.8	27 50.8	51	+21 50.4	− 22
19	128 54.4	59 33.3	39.8	185 55.8	08.5	344 39.7	24.4	248 41.0	21.8	42 14.9	52	21 48.2	− 23
20	143 56.8	74 33.1	40.3	200 56.5	08.2	359 42.2	24.4	263 43.6	21.7	56 39.1	52	21 45.9	− 24
21	158 59.3	89 33.0	·· 40.7	215 57.3	·· 07.9	14 44.6	·· 24.4	278 46.2	·· 21.7	71 03.3	52	·21 43.5	− 26
22	174 01.8	104 32.9	41.2	230 58.1	07.6	29 47.1	24.4	293 48.8	21.7	85 27.5	52	21 40.9	− 28
23	189 04.2	119 32.7	41.6	245 58.9	07.3	44 49.6	24.4	308 51.4	21.7	99 51.7	52	21 38.1	− 29
16 0	204 06.7	134 32.6	+25 42.1	260 59.7	−21 07.1	59 52.1	+15 24.4	323 54.0	−18 21.6	114 15.9	53	+21 35.2	− 30
1	219 09.2	149 32.5	42.5	276 00.4	06.8	74 54.6	24.4	338 56.6	21.6	128 40.2	53	21 32.2	− 32
2	234 11.6	164 32.4	43.0	291 01.2	06.5	89 57.0	24.4	353 59.2	21.6	143 04.5	54	21 29.0	− 33
3	249 14.1	179 32.2	·· 43.4	306 02.0	·· 06.2	104 59.5	·· 24.4	9 01.8	·· 21.5	157 28.9	54	·21 25.7	− 35
4	264 16.5	194 32.1	43.8	321 02.8	05.9	120 02.0	24.4	24 04.4	21.5	171 53.3	54	21 22.2	− 36
5	279 19.0	209 32.0	44.3	336 03.6	05.6	135 04.5	24.4	39 07.0	21.5	186 17.7	54	21 18.6	− 37
6	294 21.5	224 31.8	+25 44.7	351 04.3	−21 05.4	150 06.9	+15 24.4	54 09.6	−18 21.4	200 42.1	55	+21 14.9	− 39
7	309 23.9	239 31.7	45.2	6 05.1	05.1	165 09.4	24.4	69 12.2	21.4	215 06.6	55	21 11.0	− 41
8	324 26.4	254 31.6	45.6	21 05.9	04.8	180 11.9	24.4	84 14.8	21.4	229 31.1	56	21 06.9	− 41
9	339 28.9	269 31.5	·· 46.0	36 06.7	·· 04.5	195 14.4	·· 24.4	99 17.4	·· 21.4	243 55.7	56	·21 02.8	− 44
10	354 31.3	284 31.4	46.5	51 07.5	04.2	210 16.8	24.4	114 20.0	21.3	258 20.3	56	20 58.4	− 44
11	9 33.8	299 31.2	46.9	66 08.2	03.9	225 19.3	24.4	129 22.6	21.3	272 44.9	57	20 54.0	− 46
12	24 36.3	314 31.1	+25 47.4	81 09.0	−21 03.7	240 21.8	+15 24.4	144 25.2	−18 21.3	287 09.6	57	+20 49.4	− 47
13	39 38.7	329 31.0	47.8	96 09.8	03.4	255 24.3	24.4	159 27.8	21.2	301 34.3	58	20 44.7	− 49
14	54 41.2	344 30.9	48.2	111 10.6	03.1	270 26.7	24.4	174 30.4	21.2	315 59.1	58	20 39.8	− 50
15	69 43.6	359 30.7	·· 48.7	126 11.4	·· 02.8	285 29.2	·· 24.4	189 33.0	·· 21.2	330 23.9	59	·20 34.8	− 51
16	84 46.1	14 30.6	49.1	141 12.1	02.5	300 31.7	24.4	204 35.6	21.1	344 48.8	59	20 29.7	− 53
17	99 48.6	29 30.5	49.5	156 12.9	02.2	315 34.2	24.4	219 38.2	21.1	359 13.7	60	20 24.4	− 54
18	114 51.0	44 30.4	+25 49.9	171 13.7	−21 02.0	330 36.6	+15 24.4	234 40.8	−18 21.1	13 38.7	60	+20 19.0	− 55
19	129 53.5	59 30.3	50.4	186 14.5	01.7	345 39.1	24.4	249 43.4	21.1	28 03.7	61	20 13.5	− 57
20	144 56.0	74 30.2	50.8	201 15.3	01.4	0 41.6	24.4	264 46.0	21.0	42 28.8	61	20 07.8	− 58
21	159 58.4	89 30.0	·· 51.2	216 16.0	·· 01.1	15 44.0	·· 24.4	279 48.6	·· 21.0	56 53.9	61	·20 02.0	− 59
22	175 00.9	104 29.9	51.7	231 16.8	00.8	30 46.5	24.4	294 51.2	21.0	71 19.0	63	19 56.1	− 61
23	190 03.4	119 29.8	52.1	246 17.6	00.5	45 49.0	24.4	309 53.8	20.9	85 44.3	63	19 50.0	− 62
17 0	205 05.8	134 29.7	+25 52.5	261 18.4	−21 00.2	60 51.5	+15 24.4	324 56.4	−18 20.9	100 09.6	63	+19 43.8	− 63
1	220 08.3	149 29.6	52.9	276 19.2	20 59.9	75 53.9	24.4	339 59.0	20.9	114 34.9	64	19 37.5	− 64
2	235 10.8	164 29.5	53.4	291 20.0	59.7	90 56.4	24.4	355 01.6	20.8	129 00.3	64	19 31.1	− 66
3	250 13.2	179 29.4	·· 53.8	306 20.7	·· 59.4	105 58.9	·· 24.4	10 04.2	·· 20.8	143 25.7	65	·19 24.5	− 66
4	265 15.7	194 29.3	54.2	321 21.5	59.1	121 01.3	24.4	25 06.8	20.8	157 51.2	66	19 17.9	− 69
5	280 18.1	209 29.1	54.6	336 22.3	58.8	136 03.8	24.4	40 09.4	20.8	172 16.8	66	19 11.0	− 69
6	295 20.6	224 29.0	+25 55.0	351 23.1	−20 58.5	151 06.3	+15 24.4	55 12.0	−18 20.7	186 42.4	67	+19 04.1	− 70
7	310 23.1	239 28.9	55.4	6 23.9	58.2	166 08.7	24.4	70 14.6	20.7	201 08.1	67	18 57.1	− 72
8	325 25.5	254 28.8	55.9	21 24.7	57.9	181 11.2	24.3	85 17.2	20.7	215 33.8	69	18 49.9	− 73
9	340 28.0	269 28.7	·· 56.3	36 25.4	·· 57.6	196 13.7	·· 24.3	100 19.8	·· 20.6	229 59.7	68	·18 42.6	− 74
10	355 30.5	284 28.6	56.7	51 26.2	57.4	211 16.1	24.3	115 22.4	20.6	244 25.5	69	18 35.2	− 75
11	10 32.9	299 28.5	57.1	66 27.0	57.1	226 18.6	24.3	130 25.0	20.6	258 51.4	70	18 27.7	− 76
12	25 35.4	314 28.4	+25 57.5	81 27.8	−20 56.8	241 21.1	+15 24.3	145 27.6	−18 20.5	273 17.4	71	+18 20.1	− 78
13	40 37.9	329 28.3	57.9	96 28.6	56.5	256 23.5	24.3	160 30.2	20.5	287 43.5	71	18 12.3	− 78
14	55 40.3	344 28.2	58.3	111 29.4	56.2	271 26.0	24.3	175 32.8	20.5	302 09.6	72	18 04.5	− 80
15	70 42.8	359 28.1	·· 58.8	126 30.2	·· 55.9	286 28.5	·· 24.3	190 35.4	·· 20.4	316 35.8	72	·17 56.5	− 81
16	85 45.3	14 28.0	59.2	141 30.9	55.6	301 30.9	24.3	205 38.1	20.4	331 02.0	73	17 48.4	− 82
17	100 47.7	29 27.9	25 59.6	156 31.7	55.3	316 33.4	24.3	220 40.7	20.4	345 28.3	74	17 40.2	− 82
18	115 50.2	44 27.8	+26 00.0	171 32.5	−20 55.0	331 35.9	+15 24.3	235 43.3	−18 20.4	359 54.7	74	+17 32.0	− 84
19	130 52.6	59 27.7	00.4	186 33.3	54.7	346 38.3	24.3	250 45.9	20.3	14 21.1	75	17 23.6	− 86
20	145 55.1	74 27.6	00.8	201 34.1	54.5	1 40.8	24.3	265 48.5	20.3	28 47.6	76	17 15.0	− 86
21	160 57.6	89 27.5	·· 01.2	216 34.9	·· 54.2	16 43.3	·· 24.3	280 51.1	·· 20.3	43 14.2	76	·17 06.4	− 87
22	176 00.0	104 27.4	01.6	231 35.7	53.9	31 45.7	24.3	295 53.7	20.2	57 40.8	77	16 57.7	− 88
23	191 02.5	119 27.3	02.0	246 36.5	53.6	46 48.2	24.3	310 56.3	20.2	72 07.5	78	16 48.9	− 89
24	206 05.0	134 27.2	+26 02.4	261 37.2	−20 53.3	61 50.6	+15 24.3	325 58.9	−18 20.2	86 34.3	78	+16 40.0	− 90
code		− 1	+ 4	+ 8	+ 3	+ 25	0	+ 26	+ 1				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
15 0	179 57.8	+ 9 40.8	7	Acamar	315 51.2	−40 28.8
1	194 58.0	41.7	5	Achernar	335 59.1	−57 27.5
2	209 58.1	42.6	30	Acrux	173 56.7	−62 51.7
3	224 58.3	·· 43.5	19	Adhara	255 46.3	−28 55.0
4	239 58.4	44.4	10	Aldebaran	291 38.8	+16 25.3
5	254 58.6	45.3				
6	269 58.7	+ 9 46.2	32	Alioth	166 57.6	+56 11.7
7	284 58.9	47.1	34	Alkaid	153 32.1	+49 31.7
8	299 59.0	48.0	55	Al Na'ir	28 37.7	−47 10.2
9	314 59.2	·· 48.9	15	Alnilam	276 30.0	− 1 13.9
10	329 59.3	49.8	25	Alphard	218 38.1	− 8 28.4
11	344 59.5	50.7				
12	359 59.6	+ 9 51.5	41	Alphecca	126 47.0	+26 51.5
13	14 59.8	52.4	1	Alpheratz	358 28.2	+28 50.9
14	29 59.9	53.3	51	Altair	62 50.0	+ 8 45.0
15	45 00.1	·· 54.2	2	Ankaa	353 58.3	−42 32.5
16	60 00.3	55.1	42	Antares	113 18.6	−26 20.2
17	75 00.4	56.0				
18	90 00.6	+ 9 56.9	37	Arcturus	146 34.5	+19 24.4
19	105 00.7	57.8	43	Atria	108 58.5	−68 56.9
20	120 00.9	58.7	22	Avior	234 35.5	−59 22.5
21	135 01.0	· 9 59.6	13	Bellatrix	279 18.2	+ 6 18.6
22	150 01.2	10 00.5	16	Betelg'se	271 47.9	+ 7 23.9
23	165 01.3	01.3				
			17	Canopus	264 15.4	−52 40.6
16 0	180 01.5	+10 02.2	12	Capella	281 38.1	+45 57.4
1	195 01.6	03.1	53	Deneb	50 00.8	+45 07.2
2	210 01.8	04.0	28	Denebola	183 17.0	+14 48.8
3	225 01.9	·· 04.9	4	Diphda	349 39.2	−18 13.6
4	240 02.0	05.8				
5	255 02.2	06.7	27	Dubhe	194 43.6	+61 59.3
6	270 02.3	+10 07.6	14	Elnath	279 07.0	+28 34.3
7	285 02.5	08.4	47	Eltanin	91 05.8	+51 29.4
8	300 02.6	09.3	54	Enif	34 29.3	+ 9 40.4
9	315 02.8	·· 10.2	56	Fomalhaut	16 11.4	−29 51.1
10	330 02.9	11.1				
11	345 03.1	12.0	31	Gacrux	172 48.2	−56 52.4
12	0 03.2	+10 12.9	29	Gienah	176 36.1	−17 18.2
13	15 03.4	13.8	35	Hadar	149 48.2	−60 09.9
14	30 03.5	14.6	6	Hamal	328 49.5	+23 15.4
15	45 03.7	·· 15.5	48	Kaus Aust.	84 40.5	−34 24.3
16	60 03.8	16.4				
17	75 04.0	17.3	40	Kochab	137 16.8	+74 19.9
18	90 04.1	+10 18.2	57	Markab	14 21.3	+14 58.1
19	105 04.3	19.1	8	Menkar	315 00.2	+ 3 55.1
20	120 04.4	19.9	36	Menkent	148 57.8	−36 09.5
21	135 04.6	·· 20.8	24	Miapl'dus	221 48.6	−69 32.6
22	150 04.7	21.7				
23	165 04.9	22.6	9	Mirfak	309 42.2	+49 42.5
			50	Nunki	76 51.3	−26 21.1
17 0	180 05.0	+10 23.5	52	Peacock	54 26.7	−56 52.3
1	195 05.1	24.3	21	Pollux	244 20.1	+28 08.0
2	210 05.3	25.2	20	Procyon	245 44.6	+ 5 20.1
3	225 05.4	·· 26.1				
4	240 05.6	27.0	46	R'alhague	96 46.0	+12 35.3
5	255 05.7	27.9	26	Regulus	208 28.9	+12 10.7
6	270 05.9	+10 28.7	11	Rigel	281 53.5	− 8 15.2
7	285 06.0	29.6	38	Rigil Kent.	140 49.7	−60 39.5
8	300 06.2	30.5	44	Sabik	103 01.5	−15 40.4
9	315 06.3	·· 31.4				
10	330 06.5	32.3	3	Schedar	350 30.0	+56 17.8
11	345 06.6	33.1	45	Shaula	97 19.9	−37 04.3
12	0 06.7	+10 34.0	18	Sirius	259 11.6	−16 39.5
13	15 06.9	34.9	33	Spica	159 16.1	−10 56.2
14	30 07.0	35.8	23	Suhail	223 23.9	−43 15.7
15	45 07.2	·· 36.6				
16	60 07.3	37.5	49	Vega	81 07.8	+38 44.3
17	75 07.5	38.4	39	Zub'g'bi	137 52.6	−15 51.8
18	90 07.6	+10 39.3				
19	105 07.7	40.1				
20	120 07.9	41.0				
21	135 08.0	·· 41.9				
22	150 08.2	42.8				
23	165 08.3	43.6				
24	180 08.5	+10 44.5				
code	−	+ 9				

Lat.	Sunrise	Twlt. begins	Moonrise 15	16	17	18
N °	h m	h m	h m	h m	h m	h m
72	3 33	////	▭	▭	▭	8 48
70	3 51	////	▭	▭	6 58	9 24
68	4 05	////	3 54	5 45	7 50	9 50
66	4 16	////	5 20	6 40	8 22	10 09
64	4 26	////	5 57	7 12	8 45	10 25
62	4 34	////	6 24	7 37	9 04	10 38
60	4 41	1 25	6 45	7 56	9 19	10 49
58	4 47	1 57	7 02	8 12	9 32	10 58
56	4 52	2 20	7 17	8 25	9 43	11 06
54	4 57	2 37	7 29	8 37	9 53	11 14
52	5 01	2 51	7 40	8 47	10 02	11 20
50	5 05	3 04	7 50	8 56	10 09	11 26
45	5 14	3 27	8 11	9 16	10 26	11 39
40	5 21	3 45	8 27	9 31	10 40	11 49
35	5 27	3 59	8 41	9 45	10 51	11 58
30	5 32	4 10	8 53	9 56	11 01	12 06
20	5 41	4 26	9 14	10 16	11 18	12 19
10	5 49	4 39	9 33	10 33	11 33	12 31
0	5 56	4 47	9 50	10 49	11 47	12 42
10	6 04	4 54	10 07	11 05	12 01	12 53
20	6 11	4 57	10 25	11 23	12 16	13 05
30	6 20	4 59	10 46	11 42	12 33	13 18
35	6 25	5 00	10 58	11 54	12 43	13 26
40	6 30	4 59	11 13	12 07	12 54	13 34
45	6 36	4 57	11 30	12 23	13 07	13 44
50	6 44	4 54	11 50	12 42	13 23	13 57
52	6 47	4 54	12 00	12 51	13 31	14 02
54	6 51	4 51	12 11	13 01	13 39	14 09
56	6 55	4 49	12 24	13 12	13 48	14 16
58	7 00	4 47	12 38	13 25	13 59	14 23
60	7 05	4 44	12 56	13 40	14 11	14 32
S						

Lat.	Sunset	Twlt. ends	Moonset 15	16	17	18
N °	h m	h m	h m	h m	h m	h m
72	20 30	////	▭	▭	▭	4 27
70	20 12	////	▭	▭	4 18	3 49
68	19 58	////	3 14	3 29	3 25	3 22
66	19 46	////	1 48	2 34	2 53	3 01
64	19 36	////	1 11	2 01	2 29	2 45
62	19 28	////	0 44	1 36	2 10	2 31
60	19 21	22 45	0 23	1 17	1 54	2 19
58	19 14	22 09	0 06	1 00	1 40	2 09
56	19 09	21 46	24 47	0 47	1 29	2 00
54	19 04	21 27	24 35	0 35	1 18	1 52
52	18 59	21 12	24 24	0 24	1 09	1 45
50	18 55	20 59	24 15	0 15	1 01	1 38
45	18 47	20 35	23 55	24 44	0 44	1 24
40	18 39	20 16	23 39	24 29	0 29	1 13
35	18 33	20 03	23 25	24 17	0 17	1 03
30	18 28	19 52	23 13	24 07	0 07	0 54
20	18 19	19 35	22 53	23 48	24 39	0 39
10	18 11	19 22	22 35	23 32	24 26	0 26
0	18 03	19 13	22 18	23 17	24 14	0 14
10	17 56	19 07	22 02	23 02	24 01	0 01
20	17 48	19 02	21 44	22 46	23 47	24 48
30	17 39	18 59	21 23	22 27	23 32	24 37
35	17 35	18 59	21 11	22 16	23 23	24 30
40	17 29	18 59	20 57	22 03	23 12	24 22
45	17 23	19 01	20 40	21 48	23 00	24 14
50	17 15	19 03	20 19	21 30	22 45	24 03
52	17 11	19 03	20 10	21 21	22 38	23 58
54	17 07	19 05	19 59	21 11	22 30	23 52
56	17 03	19 07	19 46	21 00	22 22	23 46
58	16 58	19 09	19 32	20 47	22 12	23 39
60	16 53	19 12	19 14	20 33	22 00	23 31
S						

GMT	Equation of Time (App.—Mean) 15	16	17
h	m s	m s	m s
0	− 0 09.0	+ 0 05.5	+ 0 19.7
6	− 0 05.4	+ 0 09.1	+ 0 23.2
12	− 0 01.7	+ 0 12.7	+ 0 26.7
18	+ 0 01.9	+ 0 16.2	+ 0 30.1
24	+ 0 05.5	+ 0 19.7	+ 0 33.6

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
15	16 04	15 02	6 37	20 01	2 28
16	17 03	15 02	6 36	19 57	2 24
17	18 00	15 02	6 34	19 53	2 20
18	18 55	15 02	6 33	19 49	2 16

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb **Add**	Venus **Add**	Mars **Add**
°	′	′	′
0	0.3	0.2	0.1
30	0.3	0.2	0.1
45	0.3	0.1	0.1
60	0.3	0.1	0.0
75	0.3	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	15	16	17
°	′	′	′
0	18.6	18.6	18.5
4	18.6	18.6	18.5
8	18.6	18.6	18.4
12	18.5	18.5	18.4
16	18.5	18.5	18.4
20	18.4	18.4	18.3
24	18.4	18.4	18.2
28	18.3	18.3	18.2
32	18.2	18.2	18.1
36	18.1	18.1	18.0
40	18.0	18.0	17.9
44	17.9	17.9	17.8
48	17.7	17.7	17.7
52	17.6	17.6	17.5
56	17.5	17.5	17.4
60	17.3	17.3	17.3
64	17.2	17.2	17.1
68	17.0	17.0	17.0
72	16.9	16.9	16.8
76	16.7	16.7	16.7
80	16.5	16.5	16.5
84	16.4	16.4	16.3
88	16.2	16.2	16.2
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	15	16	17
°	′	′	′
0	13.8	13.8	13.9
4	13.8	13.8	13.9
8	13.8	13.8	13.9
12	13.9	13.9	13.9
16	13.9	13.9	14.0
20	14.0	14.0	14.0
24	14.0	14.0	14.1
28	14.1	14.1	14.2
32	14.2	14.2	14.3
36	14.3	14.3	14.4
40	14.4	14.4	14.5
44	14.5	14.5	14.6
48	14.7	14.7	14.7
52	14.8	14.8	14.8
56	14.9	14.9	15.0
60	15.1	15.1	15.1
64	15.2	15.2	15.2
68	15.4	15.4	15.4
72	15.5	15.5	15.5
76	15.7	15.7	15.7
80	15.9	15.9	15.9
84	16.0	16.0	16.0
88	16.2	16.2	16.1
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −4.0 GHA	Dec.	MARS 0.5 GHA	Dec.	JUPITER −1.8 GHA	Dec.	SATURN 0.4 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
18 0	206 05.0	134 27.2	+26 02.4	261 37.2	−20 53.3	61 50.6	+15 24.3	325 58.9	−18 20.2	86 34.3	78	+16 40.0	90
1	221 07.4	149 27.1	02.8	276 38.0	53.0	76 53.1	24.3	341 01.5	20.1	101 01.1	79	16 31.0	91
2	236 09.9	164 27.0	03.2	291 38.8	52.7	91 55.6	24.3	356 04.1	20.1	115 28.0	79	16 21.9	93
3	251 12.4	179 26.9	03.6	306 39.6	52.4	106 58.0	24.2	11 06.7	20.1	129 54.9	80	16 12.6	93
4	266 14.8	194 26.8	04.0	321 40.4	52.1	122 00.5	24.2	26 09.3	20.0	144 21.9	81	16 03.3	94
5	281 17.3	209 26.7	04.4	336 41.2	51.8	137 03.0	24.2	41 11.9	20.0	158 49.0	82	15 53.9	95
6	296 19.7	224 26.6	+26 04.8	351 42.0	−20 51.5	152 05.4	+15 24.2	56 14.5	−18 20.0	173 16.2	82	+15 44.4	95
7	311 22.2	239 26.5	05.2	6 42.8	51.2	167 07.9	24.2	71 17.1	20.0	187 43.4	83	15 34.9	97
8	326 24.7	254 26.4	05.6	21 43.5	50.9	182 10.3	24.2	86 19.7	19.9	202 10.7	83	15 25.2	98
9	341 27.1	269 26.4	06.0	36 44.3	50.7	197 12.8	24.2	101 22.3	19.9	216 38.0	84	15 15.4	98
10	356 29.6	284 26.3	06.4	51 45.1	50.4	212 15.3	24.2	116 25.0	19.9	231 05.4	85	15 05.6	100
11	11 32.1	299 26.2	06.7	66 45.9	50.1	227 17.7	24.2	131 27.6	19.8	245 32.9	85	14 55.6	100
12	26 34.5	314 26.1	+26 07.1	81 46.7	−20 49.8	242 20.2	+15 24.2	146 30.2	−18 19.8	260 00.4	86	+14 45.6	101
13	41 37.0	329 26.0	07.5	96 47.5	49.5	257 22.6	24.2	161 32.8	19.8	274 28.0	87	14 35.5	102
14	56 39.5	344 25.9	07.9	111 48.3	49.2	272 25.1	24.2	176 35.4	19.7	288 55.7	87	14 25.3	103
15	71 41.9	359 25.8	08.3	126 49.1	48.9	287 27.5	24.2	191 38.0	19.7	303 23.4	88	14 15.0	103
16	86 44.4	14 25.7	08.7	141 49.9	48.6	302 30.0	24.2	206 40.6	19.7	317 51.2	89	14 04.7	105
17	101 46.9	29 25.7	09.1	156 50.6	48.3	317 32.5	24.1	221 43.2	19.6	332 19.1	89	13 54.2	105
18	116 49.3	44 25.6	+26 09.5	171 51.4	−20 48.0	332 34.9	+15 24.1	236 45.8	−18 19.6	346 47.0	90	+13 43.7	106
19	131 51.8	59 25.5	09.8	186 52.2	47.7	347 37.4	24.1	251 48.4	19.6	1 15.0	90	13 33.1	106
20	146 54.2	74 25.4	10.2	201 53.0	47.4	2 39.8	24.1	266 51.0	19.5	15 43.0	92	13 22.5	108
21	161 56.7	89 25.3	10.6	216 53.8	47.1	17 42.3	24.1	281 53.6	19.5	30 11.2	91	13 11.7	108
22	176 59.2	104 25.3	11.0	231 54.6	46.8	32 44.7	24.1	296 56.2	19.5	44 39.3	93	13 00.9	109
23	192 01.6	119 25.2	11.4	246 55.4	46.5	47 47.2	24.1	311 58.8	19.5	59 07.6	92	12 50.0	109
19 0	207 04.1	134 25.1	+26 11.7	261 56.2	−20 46.2	62 49.6	+15 24.1	327 01.5	−18 19.4	73 35.8	94	+12 39.1	110
1	222 06.6	149 25.0	12.1	276 57.0	45.9	77 52.1	24.1	342 04.1	19.4	88 04.2	94	12 28.1	111
2	237 09.0	164 24.9	12.5	291 57.8	45.6	92 54.6	24.1	357 06.7	19.4	102 32.6	95	12 17.0	112
3	252 11.5	179 24.9	12.9	306 58.6	45.3	107 57.0	24.1	12 09.3	19.3	117 01.1	95	12 05.8	112
4	267 14.0	194 24.8	13.2	321 59.4	45.0	122 59.5	24.1	27 11.9	19.3	131 29.6	96	11 54.6	113
5	282 16.4	209 24.7	13.6	337 00.1	44.7	138 01.9	24.0	42 14.5	19.3	145 58.2	96	11 43.3	113
6	297 18.9	224 24.6	+26 14.0	352 00.9	−20 44.4	153 04.4	+15 24.0	57 17.1	−18 19.2	160 26.8	97	+11 32.0	114
7	312 21.4	239 24.6	14.4	7 01.7	44.1	168 06.8	24.0	72 19.7	19.2	174 55.5	98	11 20.6	115
8	327 23.8	254 24.5	14.7	22 02.5	43.8	183 09.3	24.0	87 22.3	19.2	189 24.3	98	11 09.1	115
9	342 26.3	269 24.4	15.1	37 03.3	43.5	198 11.7	24.0	102 24.9	19.1	203 53.1	99	10 57.6	116
10	357 28.7	284 24.4	15.5	52 04.1	43.2	213 14.2	24.0	117 27.5	19.1	218 22.0	99	10 46.0	116
11	12 31.2	299 24.3	15.8	67 04.9	42.9	228 16.6	24.0	132 30.2	19.1	232 50.9	100	10 34.4	117
12	27 33.7	314 24.2	+26 16.2	82 05.7	−20 42.6	243 19.1	+15 24.0	147 32.8	−18 19.0	247 19.9	100	+10 22.7	118
13	42 36.1	329 24.2	16.6	97 06.5	42.3	258 21.5	24.0	162 35.4	19.0	261 48.9	101	10 10.9	118
14	57 38.6	344 24.1	16.9	112 07.3	42.0	273 24.0	24.0	177 38.0	19.0	276 18.0	102	9 59.1	118
15	72 41.1	359 24.0	17.3	127 08.1	41.7	288 26.4	23.9	192 40.6	18.9	290 47.2	102	9 47.3	119
16	87 43.5	14 24.0	17.7	142 08.9	41.4	303 28.9	23.9	207 43.2	18.9	305 16.4	102	9 35.4	119
17	102 46.0	29 23.9	18.0	157 09.7	41.1	318 31.3	23.9	222 45.8	18.9	319 45.6	103	9 23.5	120
18	117 48.5	44 23.8	+26 18.4	172 10.5	−20 40.8	333 33.8	+15 23.9	237 48.4	−18 18.9	334 14.9	103	+9 11.5	121
19	132 50.9	59 23.8	18.7	187 11.3	40.5	348 36.2	23.9	252 51.0	18.8	348 44.2	104	8 59.4	121
20	147 53.4	74 23.7	19.1	202 12.1	40.2	3 38.7	23.9	267 53.6	18.8	3 13.6	105	8 47.3	121
21	162 55.8	89 23.6	19.5	217 12.9	39.9	18 41.1	23.9	282 56.3	18.8	17 43.1	105	8 35.2	121
22	177 58.3	104 23.6	19.8	232 13.7	39.6	33 43.6	23.9	297 58.9	18.7	32 12.6	105	8 23.1	123
23	193 00.8	119 23.5	20.2	247 14.4	39.3	48 46.0	23.9	313 01.5	18.7	46 42.1	106	8 10.8	122
20 0	208 03.2	134 23.5	+26 20.5	262 15.2	−20 39.0	63 48.5	+15 23.9	328 04.1	−18 18.7	61 11.7	106	+ 7 58.6	123
1	223 05.7	149 23.4	20.9	277 16.0	38.7	78 50.9	23.8	343 06.7	18.6	75 41.3	107	7 46.3	123
2	238 08.2	164 23.3	21.2	292 16.8	38.4	93 53.4	23.8	358 09.3	18.6	90 11.0	107	7 34.0	124
3	253 10.6	179 23.3	21.6	307 17.6	38.1	108 55.8	23.8	13 11.9	18.6	104 40.7	108	7 21.6	124
4	268 13.1	194 23.2	21.9	322 18.4	37.8	123 58.3	23.8	28 14.5	18.5	119 10.5	108	7 09.2	124
5	283 15.6	209 23.2	22.3	337 19.2	37.5	139 00.7	23.8	43 17.1	18.5	133 40.3	108	6 56.8	125
6	298 18.0	224 23.1	+26 22.6	352 20.0	−20 37.2	154 03.1	+15 23.8	58 19.8	−18 18.5	148 10.1	109	+ 6 44.3	124
7	313 20.5	239 23.1	23.0	7 20.8	36.9	169 05.6	23.8	73 22.4	18.4	162 40.0	109	6 31.9	126
8	328 23.0	254 23.0	23.3	22 21.6	36.6	184 08.0	23.8	88 25.0	18.4	177 09.9	110	6 19.3	125
9	343 25.4	269 23.0	23.7	37 22.4	36.3	199 10.5	23.8	103 27.6	18.4	191 39.9	110	6 06.8	126
10	358 27.9	284 22.9	24.0	52 23.2	36.0	214 12.9	23.7	118 30.2	18.3	206 09.9	111	5 54.2	126
11	13 30.3	299 22.9	24.4	67 24.0	35.7	229 15.4	23.7	133 32.8	18.3	220 40.0	111	5 41.6	126
12	28 32.8	314 22.8	+26 24.7	82 24.8	−20 35.4	244 17.8	+15 23.7	148 35.4	−18 18.3	235 10.1	111	+ 5 29.0	127
13	43 35.3	329 22.8	25.1	97 25.6	35.1	259 20.3	23.7	163 38.0	18.2	249 40.2	111	5 16.3	126
14	58 37.7	344 22.7	25.4	112 26.4	34.8	274 22.7	23.7	178 40.7	18.2	264 10.3	112	5 03.7	127
15	73 40.2	359 22.7	25.7	127 27.2	34.5	289 25.1	23.7	193 43.3	18.2	278 40.5	112	4 51.0	127
16	88 42.7	14 22.6	26.1	142 28.0	34.2	304 27.6	23.7	208 45.9	18.2	293 10.7	113	4 38.3	128
17	103 45.1	29 22.6	26.4	157 28.8	33.9	319 30.0	23.6	223 48.5	18.1	307 41.0	113	4 25.5	127
18	118 47.6	44 22.5	+26 26.7	172 29.6	−20 33.6	334 32.5	+15 23.6	238 51.1	−18 18.1	322 11.3	113	+ 4 12.8	128
19	133 50.1	59 22.5	27.1	187 30.4	33.3	349 34.9	23.6	253 53.7	18.1	336 41.6	114	4 00.0	127
20	148 52.5	74 22.5	27.4	202 31.2	33.0	4 37.4	23.6	268 56.3	18.0	351 12.0	114	3 47.3	128
21	163 55.0	89 22.4	27.8	217 32.0	32.7	19 39.8	23.6	283 58.9	18.0	5 42.4	114	3 34.5	128
22	178 57.5	104 22.4	28.1	232 32.8	32.3	34 42.2	23.6	299 01.6	18.0	20 12.8	114	3 21.7	129
23	193 59.9	119 22.3	28.4	247 33.6	32.0	49 44.7	23.6	314 04.2	17.9	34 43.2	115	3 08.8	128
24	209 02.4	134 22.3	+26 28.8	262 34.4	−20 31.7	64 47.1	+15 23.6	329 06.8	−18 17.9	49 13.7	115	+ 2 56.0	128
code	—	0	+ 4	+ 8	+ 3	+ 24	0	+ 26	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
18 0	180 08.5	+10 44.5
1	195 08.6	45.4
2	210 08.7	46.3
3	225 08.9	·· 47.1
4	240 09.0	48.0
5	255 09.2	48.9
6	270 09.3	+10 49.8
7	285 09.4	50.6
8	300 09.6	51.5
9	315 09.7	·· 52.4
10	330 09.9	53.2
11	345 10.0	54.1
12	0 10.2	+10 55.0
13	15 10.3	55.9
14	30 10.4	56.7
15	45 10.6	·· 57.6
16	60 10.7	58.5
17	75 10.9	10 59.3
18	90 11.0	+11 00.2
19	105 11.1	01.1
20	120 11.3	01.9
21	135 11.4	·· 02.8
22	150 11.5	03.7
23	165 11.7	04.5
19 0	180 11.8	+11 05.4
1	195 12.0	06.3
2	210 12.1	07.1
3	225 12.2	·· 08.0
4	240 12.4	08.9
5	255 12.5	09.7
6	270 12.7	+11 10.6
7	285 12.8	11.5
8	300 12.9	12.3
9	315 13.1	·· 13.2
10	330 13.2	14.1
11	345 13.3	14.9
12	0 13.5	+11 15.8
13	15 13.6	16.6
14	30 13.7	17.5
15	45 13.9	·· 18.4
16	60 14.0	19.2
17	75 14.2	20.1
18	90 14.3	+11 20.9
19	105 14.4	21.8
20	120 14.6	22.7
21	135 14.7	·· 23.5
22	150 14.8	24.4
23	165 15.0	25.2
20 0	180 15.1	+11 26.1
1	195 15.2	27.0
2	210 15.4	27.8
3	225 15.5	·· 28.7
4	240 15.6	29.5
5	255 15.8	30.4
6	270 15.9	+11 31.3
7	285 16.0	32.1
8	300 16.2	33.0
9	315 16.3	·· 33.8
10	330 16.4	34.7
11	345 16.6	35.5
12	0 16.7	+11 36.4
13	15 16.8	37.2
14	30 17.0	38.1
15	45 17.1	·· 38.9
16	60 17.2	39.8
17	75 17.4	40.7
18	90 17.5	+11 41.5
19	105 17.6	42.4
20	120 17.7	43.2
21	135 17.9	·· 44.1
22	150 18.0	44.9
23	165 18.1	45.8
24	180 18.3	+11 46.6
code	—	+ 8

STARS No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 51.2	−40 28.8
5	Achernar	335 59.1	−57 27.4
30	Acrux	173 56.7	−62 51.7
19	Adhara	255 46.3	−28 55.0
10	Aldebaran	291 38.9	+16 25.3
32	Alioth	166 57.6	+56 11.7
34	Alkaid	153 32.1	+49 31.7
55	Al Na'ir	28 37.7	−47 10.2
15	Alnilam	276 30.1	− 1 13.9
25	Alphard	218 38.1	− 8 28.4
41	Alphecca	126 46.9	+26 51.5
1	Alpheratz	358 28.2	+28 50.9
51	Altair	62 50.0	+ 8 45.0
2	Ankaa	353 58.3	−42 32.5
42	Antares	113 18.6	−26 20.2
37	Arcturus	146 34.5	+19 24.4
43	Atria	108 58.5	−68 56.9
22	Avior	234 35.5	−59 22.5
13	Bellatrix	279 18.2	+ 6 18.6
16	Betelg'se	271 47.9	+ 7 23.9
	Canopus	264 15.4	−52 40.6
12	Capella	281 38.1	+45 57.4
53	Deneb	50 00.8	+45 07.2
28	Denebola	183 17.0	+14 48.8
4	Diphda	349 39.2	−18 13.6
27	Dubhe	194 43.6	+61 59.3
14	Elnath	279 07.0	+28 34.3
47	Eltanin	91 05.8	+51 29.4
54	Enif	34 29.3	+ 9 40.4
56	Fomalhaut	16 11.4	−29 51.1
31	Gacrux	172 48.2	−56 52.4
29	Gienah	176 36.1	−17 18.2
35	Hadar	149 48.2	−60 09.9
6	Hamal	328 49.5	+23 15.4
48	Kaus Aust.	84 40.4	−34 24.3
40	Kochab	137 16.8	+74 19.9
57	Markab	14 21.3	+14 58.1
8	Menkar	315 00.2	+ 3 55.1
36	Menkent	148 57.8	−36 09.5
24	Miapl'dus	221 48.6	−69 32.6
9	Mirfak	309 42.2	+49 42.5
50	Nunki	76 51.3	−26 21.1
52	Peacock	54 26.7	−56 52.3
21	Pollux	244 20.1	+28 08.0
20	Procyon	245 44.6	+ 5 20.1
46	R'alhague	96 46.0	+12 35.3
26	Regulus	208 28.9	+12 10.7
11	Rigel	281 53.5	− 8 15.2
38	Rigil Kent.	140 49.7	−60 39.5
44	Sabik	103 01.5	−15 40.4
3	Schedar	350 30.0	+56 17.8
45	Shaula	97 19.9	−37 04.3
18	Sirius	259 11.6	−16 39.5
33	Spica	159 16.1	−10 56.2
23	Suhail	223 23.9	−43 15.7
49	Vega	81 07.8	+38 44.3
39	Zub'g'bi	137 52.6	−15 51.8

Lat. N °	Sunrise h m	Twlt. begins h m
72	3 15	////
70	3 36	////
68	3 52	////
66	4 04	////
64	4 15	////
62	4 24	////
60	4 32	0 58
58	4 39	1 39
56	4 45	2 06
54	4 50	2 26
52	4 55	2 42
50	4 59	2 55
45	5 09	3 20
40	5 16	3 40
35	5 23	3 54
30	5 29	4 06
20	5 39	4 24
10	5 48	4 36
0	5 56	4 46
10	6 04	4 53
20	6 12	4 58
30	6 21	5 01
35	6 27	5 02
40	6 33	5 02
45	6 40	5 01
50	6 48	4 59
52	6 52	4 57
54	6 56	4 57
56	7 01	4 55
58	7 06	4 53
60	7 12	4 51

Moonrise	18	19	20	21
Lat. N °	h m	h m	h m	h m
72	8 48	11 12	13 19	15 19
70	9 24	11 30	13 26	15 18
68	9 50	11 43	13 32	15 18
66	10 09	11 55	13 37	15 17
64	10 25	12 04	13 42	15 17
62	10 38	12 12	13 45	15 17
60	10 49	12 19	13 49	15 16
58	10 58	12 25	13 51	15 16
56	11 06	12 31	13 54	15 16
54	11 14	12 35	13 56	15 16
52	11 20	12 40	13 58	15 16
50	11 26	12 43	14 00	15 15
45	11 39	12 52	14 04	15 15
40	11 49	12 59	14 07	15 15
35	11 58	13 05	14 10	15 15
30	12 06	13 10	14 13	15 14
20	12 19	13 19	14 17	15 14
10	12 31	13 27	14 21	15 14
0	12 42	13 35	14 25	15 14
10	12 53	13 42	14 28	15 13
20	13 05	13 50	14 32	15 13
30	13 18	13 59	14 37	15 13
35	13 26	14 04	14 39	15 13
40	13 34	14 10	14 42	15 13
45	13 44	14 17	14 45	15 12
50	13 57	14 25	14 49	15 12
52	14 02	14 28	14 51	15 12
54	14 09	14 32	14 53	15 12
56	14 16	14 37	14 55	15 12
58	14 23	14 42	14 58	15 12
60	14 32	14 48	15 00	15 12

Lat. N °	Sunset h m	Twlt. ends h m
72	20 47	////
70	20 26	////
68	20 10	////
66	19 56	////
64	19 45	////
62	19 36	////
60	19 28	23 15
58	19 21	22 26
56	19 15	21 58
54	19 09	21 37
52	19 05	21 21
50	19 00	21 07
45	18 50	20 40
40	18 42	20 21
35	18 36	20 06
30	18 30	19 54
20	18 20	19 36
10	18 11	19 23
0	18 02	19 12
10	17 54	19 05
20	17 46	19 00
30	17 36	18 56
35	17 31	18 56
40	17 25	18 55
45	17 18	18 56
50	17 09	18 57
52	17 05	18 58
54	17 01	18 59
56	16 56	19 00
58	16 51	19 03
60	16 45	19 05

Moonset	18	19	20	21
Lat. N °	h m	h m	h m	h m
72	4 27	3 54	3 33	3 15
70	3 49	3 34	3 23	3 13
68	3 22	3 18	3 14	3 10
66	3 01	3 05	3 07	3 08
64	2 45	2 55	3 01	3 06
62	2 31	2 45	2 56	3 05
60	2 19	2 38	2 52	3 04
58	2 09	2 31	2 48	3 03
56	2 00	2 24	2 44	3 02
54	1 52	2 19	2 41	3 01
52	1 45	2 14	2 38	3 00
50	1 38	2 09	2 35	2 59
45	1 24	1 59	2 30	2 57
40	1 13	1 51	2 25	2 56
35	1 03	1 44	2 20	2 55
30	0 54	1 37	2 17	2 53
20	0 39	1 26	2 10	2 52
10	0 26	1 17	2 04	2 50
0	0 14	1 07	1 59	2 48
10	0 01	0 58	1 53	2 46
20	24 48	0 48	1 47	2 44
30	24 37	0 37	1 40	2 42
35	24 30	0 30	1 36	2 41
40	24 22	0 22	1 32	2 40
45	24 14	0 14	1 26	2 38
50	24 03	0 03	1 20	2 36
52	23 58	25 17	1 17	2 35
54	23 52	25 14	1 14	2 34
56	23 46	25 10	1 10	2 33
58	23 39	25 06	1 06	2 32
60	23 31	25 01	1 01	2 30

GMT	Equation of Time (App.—Mean) 18	19	20
h	m s	m s	m s
0	+ 0 33.6	+ 0 47.0	+ 1 00.1
6	+ 0 37.0	+ 0 50.3	+ 1 03.3
12	+ 0 40.3	+ 0 53.6	+ 1 06.5
18	+ 0 43.7	+ 0 56.9	+ 1 09.7
24	+ 0 47.0	+ 1 00.1	+ 1 12.8

GMT of Transit Meridian of Greenwich	DAY	Moon	Venus	Mars	Jupiter	Saturn
		h m	h m	h m	h m	h m
	18	18 55	15 02	6 33	19 49	2 16
	19	19 47	15 02	6 32	19 46	2 12
	20	20 36	15 03	6 31	19 42	2 07
	21	21 25	15 03	6 29	19 38	2 03

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.2	0.2	0.1
30	0.2	0.2	0.1
45	0.2	0.1	0.1
60	0.2	0.1	0.0
75	0.2	0.0	0.0
90			

Moon's Lower Limb Add

Alt. °	18 ′	19 ′	20 ′
0	18.2	17.8	17.5
4	18.2	17.8	17.5
8	18.2	17.8	17.4
12	18.2	17.8	17.4
16	18.1	17.8	17.4
20	18.1	17.7	17.4
24	18.0	17.7	17.3
28	17.9	17.6	17.3
32	17.9	17.5	17.2
36	17.8	17.5	17.1
40	17.7	17.4	17.1
44	17.6	17.3	17.0
48	17.5	17.2	16.9
52	17.4	17.1	16.8
56	17.2	17.0	16.8
60	17.1	16.9	16.7
64	17.0	16.8	16.6
68	16.8	16.7	16.5
72	16.7	16.5	16.4
76	16.6	16.4	16.3
80	16.4	16.3	16.2
84	16.3	16.2	16.1
88	16.2	16.1	16.0
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt. °	18 ′	19 ′	20 ′
0	14.0	14.2	14.5
4	14.0	14.3	14.5
8	14.1	14.3	14.5
12	14.1	14.3	14.5
16	14.1	14.3	14.5
20	14.2	14.4	14.6
24	14.2	14.4	14.6
28	14.3	14.5	14.7
32	14.4	14.5	14.7
36	14.5	14.6	14.8
40	14.6	14.7	14.8
44	14.7	14.8	14.9
48	14.8	14.9	15.0
52	14.9	15.0	15.1
56	15.0	15.1	15.2
60	15.1	15.2	15.3
64	15.3	15.3	15.3
68	15.4	15.4	15.4
72	15.5	15.5	15.5
76	15.7	15.7	15.6
80	15.8	15.8	15.8
84	16.0	15.9	15.9
88	16.1	16.0	15.9
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −4.1 GHA	Dec.	MARS 0.4 GHA	Dec.	JUPITER −1.8 GHA	Dec.	SATURN 0.4 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
21 00	209 02.4	134 22.3	+26 28.8	262 34.4	−20 31.7	64 47.1	+15 23.6	329 06.8	−18 17.9	49 13.7	115	+ 2 56.0	−128
01	224 04.8	149 22.3	29.1	277 35.2	31.4	79 49.6	23.5	344 09.4	17.9	63 44.2	115	2 43.2	−129
02	239 07.3	164 22.2	29.4	292 36.0	31.1	94 52.0	23.5	359 12.0	17.8	78 14.7	115	2 30.3	−128
03	254 09.8	179 22.2	·· 29.7	307 36.8	·· 30.8	109 54.4	·· 23.5	14 14.6	·· 17.8	92 45.2	116	· 2 17.5	−129
04	269 12.2	194 22.2	30.1	322 37.6	30.5	124 56.9	23.5	29 17.2	17.8	107 15.8	116	2 04.6	−128
05	284 14.7	209 22.1	30.4	337 38.4	30.2	139 59.3	23.5	44 19.9	17.7	121 46.4	116	1 51.8	−129
06	299 17.2	224 22.1	+26 30.7	352 39.2	−20 29.9	155 01.7	+15 23.5	59 22.5	−18 17.7	136 17.0	117	+ 1 38.9	−129
07	314 19.6	239 22.1	31.1	7 40.0	29.6	170 04.2	23.5	74 25.1	17.7	150 47.7	116	1 26.0	−128
08	329 22.1	254 22.0	31.4	22 40.8	29.3	185 06.6	23.4	89 27.7	17.6	165 18.3	117	1 13.2	−129
09	344 24.6	269 22.0	·· 31.7	37 41.6	·· 29.0	200 09.1	·· 23.4	104 30.3	·· 17.6	179 49.0	117	· 1 00.3	−129
10	359 27.0	284 22.0	32.0	52 42.4	28.7	215 11.5	23.4	119 32.9	17.6	194 19.7	117	0 47.4	−128
11	14 29.5	299 21.9	32.3	67 43.2	28.3	230 13.9	23.4	134 35.5	17.5	208 50.4	118	0 34.6	−129
12	29 31.9	314 21.9	+26 32.7	82 44.0	−20 28.0	245 16.4	+15 23.4	149 38.2	−18 17.5	223 21.2	117	+ 0 21.7	−128
13	44 34.4	329 21.9	33.0	97 44.8	27.7	260 18.8	23.4	164 40.8	17.5	237 51.9	118	+ 0 08.9	−129
14	59 36.9	344 21.9	33.3	112 45.6	27.4	275 21.2	23.4	179 43.4	17.4	252 22.7	118	− 0 04.0	−128
15	74 39.3	359 21.8	·· 33.6	127 46.5	·· 27.1	290 23.7	·· 23.3	194 46.0	·· 17.4	266 53.5	118	· 0 16.8	−129
16	89 41.8	14 21.8	33.9	142 47.3	26.8	305 26.1	23.3	209 48.6	17.4	281 24.3	118	0 29.7	−128
17	104 44.3	29 21.8	34.3	157 48.1	26.5	320 28.5	23.3	224 51.2	17.3	295 55.1	119	0 42.5	−128
18	119 46.7	44 21.8	+26 34.6	172 48.9	−20 26.2	335 31.0	+15 23.3	239 53.9	−18 17.3	310 26.0	118	− 0 55.3	−128
19	134 49.2	59 21.8	34.9	187 49.7	25.9	350 33.4	23.3	254 56.5	17.3	324 56.8	119	1 08.1	−128
20	149 51.7	74 21.7	35.2	202 50.5	25.6	5 35.8	23.3	269 59.1	17.2	339 27.7	118	1 20.9	−128
21	164 54.1	89 21.7	·· 35.5	217 51.3	·· 25.2	20 38.3	·· 23.2	285 01.7	·· 17.2	353 58.5	119	· 1 33.7	−127
22	179 56.6	104 21.7	35.8	232 52.1	24.9	35 40.7	23.2	300 04.3	17.2	8 29.4	119	1 46.4	−128
23	194 59.1	119 21.7	36.1	247 52.9	24.6	50 43.1	23.2	315 06.9	17.1	23 00.3	119	1 59.2	−127
22 00	210 01.5	134 21.7	+26 36.4	262 53.7	−20 24.3	65 45.6	+15 23.2	330 09.6	−18 17.1	37 31.2	119	− 2 11.9	−127
01	225 04.0	149 21.7	36.7	277 54.5	24.0	80 48.0	23.2	345 12.2	17.1	52 02.1	119	2 24.6	−127
02	240 06.4	164 21.6	37.1	292 55.3	23.7	95 50.4	23.2	0 14.8	17.0	66 33.0	119	2 37.3	−127
03	255 08.9	179 21.6	·· 37.4	307 56.1	·· 23.4	110 52.9	·· 23.2	15 17.4	·· 17.0	81 03.9	120	· 2 50.0	−126
04	270 11.4	194 21.6	37.7	322 56.9	23.1	125 55.3	23.1	30 20.0	17.0	95 34.9	119	3 02.6	−126
05	285 13.8	209 21.6	38.0	337 57.7	22.7	140 57.7	23.1	45 22.6	17.0	110 05.8	119	3 15.2	−126
06	300 16.3	224 21.6	+26 38.3	352 58.5	−20 22.4	156 00.2	+15 23.1	60 25.3	−18 16.9	124 36.7	120	− 3 27.8	−126
07	315 18.8	239 21.6	38.6	7 59.3	22.1	171 02.6	23.1	75 27.9	16.9	139 07.7	119	3 40.4	−126
08	330 21.2	254 21.6	38.9	23 00.1	21.8	186 05.0	23.1	90 30.5	16.9	153 38.6	119	3 53.0	−125
09	345 23.7	269 21.6	·· 39.2	38 01.0	·· 21.5	201 07.4	·· 23.1	105 33.1	·· 16.8	168 09.5	120	· 4 05.5	−125
10	0 26.2	284 21.6	39.5	53 01.8	21.2	216 09.9	23.0	120 35.7	16.8	182 40.5	119	4 18.0	−124
11	15 28.6	299 21.6	39.8	68 02.6	20.9	231 12.3	23.0	135 38.3	16.8	197 11.4	120	4 30.4	−125
12	30 31.1	314 21.6	+26 40.1	83 03.4	−20 20.6	246 14.7	+15 23.0	150 41.0	−18 16.7	211 42.4	119	− 4 42.9	−124
13	45 33.5	329 21.6	40.4	98 04.2	20.2	261 17.2	23.0	165 43.6	16.7	226 13.3	120	4 55.3	−124
14	60 36.0	344 21.5	40.7	113 05.0	19.9	276 19.6	23.0	180 46.2	16.7	240 44.3	119	5 07.7	−123
15	75 38.5	359 21.5	·· 41.0	128 05.8	·· 19.6	291 22.0	·· 22.9	195 48.8	·· 16.6	255 15.2	120	· 5 20.0	−123
16	90 40.9	14 21.5	41.3	143 06.6	19.3	306 24.4	22.9	210 51.4	16.6	269 46.2	119	5 32.3	−123
17	105 43.4	29 21.6	41.6	158 07.4	19.0	321 26.9	22.9	225 54.1	16.6	284 17.1	120	5 44.6	−122
18	120 45.9	44 21.6	+26 41.8	173 08.2	−20 18.7	336 29.3	+15 22.9	240 56.7	−18 16.5	298 48.1	119	− 5 56.8	−122
19	135 48.3	59 21.6	42.1	188 09.0	18.4	351 31.7	22.9	255 59.3	16.5	313 19.0	119	6 09.0	−122
20	150 50.8	74 21.6	42.4	203 09.8	18.0	6 34.1	22.9	271 01.9	16.5	327 49.9	119	6 21.2	−121
21	165 53.3	89 21.6	·· 42.7	218 10.7	·· 17.7	21 36.6	·· 22.8	286 04.5	·· 16.4	342 20.8	120	· 6 33.3	−121
22	180 55.7	104 21.6	43.0	233 11.5	17.4	36 39.0	22.8	301 07.1	16.4	356 51.8	119	6 45.4	−120
23	195 58.2	119 21.6	43.3	248 12.3	17.1	51 41.4	22.8	316 09.8	16.4	11 22.7	119	6 57.4	−120
23 00	211 00.7	134 21.6	+26 43.6	263 13.1	−20 16.8	66 43.8	+15 22.8	331 12.4	−18 16.3	25 53.6	119	− 7 09.4	−119
01	226 03.1	149 21.6	43.9	278 13.9	16.5	81 46.3	22.8	346 15.0	16.3	40 24.5	119	7 21.3	−119
02	241 05.6	164 21.6	44.1	293 14.7	16.1	96 48.7	22.7	1 17.6	16.3	54 55.4	118	7 33.2	−119
03	256 08.0	179 21.6	·· 44.4	308 15.5	·· 15.8	111 51.1	·· 22.7	16 20.2	·· 16.2	69 26.2	119	· 7 45.1	−118
04	271 10.5	194 21.6	44.7	323 16.3	15.5	126 53.5	22.7	31 22.9	16.2	83 57.1	119	7 56.9	−118
05	286 13.0	209 21.6	45.0	338 17.1	15.2	141 56.0	22.7	46 25.5	16.2	98 28.0	118	8 08.7	−117
06	301 15.4	224 21.7	+26 45.3	353 18.0	−20 14.9	156 58.4	+15 22.7	61 28.1	−18 16.1	112 58.8	119	− 8 20.4	−116
07	316 17.9	239 21.7	45.6	8 18.8	14.6	172 00.8	22.6	76 30.7	16.1	127 29.7	118	8 32.0	−117
08	331 20.4	254 21.7	45.8	23 19.6	14.2	187 03.2	22.6	91 33.3	16.1	142 00.5	118	8 43.7	−115
09	346 22.8	269 21.7	·· 46.1	38 20.4	·· 13.9	202 05.7	·· 22.6	106 36.0	·· 16.0	156 31.3	118	· 8 55.2	−115
10	1 25.3	284 21.7	46.4	53 21.2	13.6	217 08.1	22.6	121 38.6	16.0	171 02.1	118	9 06.7	−115
11	16 27.8	299 21.7	46.7	68 22.0	13.3	232 10.5	22.6	136 41.2	16.0	185 32.9	118	9 18.2	−114
12	31 30.2	314 21.8	+26 46.9	83 22.8	−20 13.0	247 12.9	+15 22.6	151 43.8	−18 15.9	200 03.7	117	− 9 29.6	−113
13	46 32.7	329 21.8	47.2	98 23.6	12.6	262 15.3	22.5	166 46.4	15.9	214 34.4	118	9 40.9	−113
14	61 35.2	344 21.8	47.5	113 24.5	12.3	277 17.8	22.5	181 49.1	15.9	229 05.2	117	9 52.2	−113
15	76 37.6	359 21.8	·· 47.8	128 25.3	·· 12.0	292 20.2	·· 22.5	196 51.7	·· 15.8	243 35.9	118	·10 03.5	−111
16	91 40.1	14 21.9	48.0	143 26.1	11.7	307 22.6	22.5	211 54.3	15.8	258 06.7	117	10 14.6	−112
17	106 42.5	29 21.9	48.3	158 26.9	11.4	322 25.0	22.5	226 56.9	15.8	272 37.4	117	10 25.8	−110
18	121 45.0	44 21.9	+26 48.6	173 27.7	−20 11.0	337 27.4	+15 22.4	241 59.5	−18 15.7	287 08.1	116	−10 36.8	−110
19	136 47.5	59 21.9	48.8	188 28.5	10.7	352 29.9	22.4	257 02.2	15.7	301 38.7	117	10 47.8	−109
20	151 49.9	74 22.0	49.1	203 29.3	10.4	7 32.3	22.4	272 04.8	15.7	316 09.4	116	10 58.7	−109
21	166 52.4	89 22.0	·· 49.4	218 30.1	·· 10.1	22 34.7	·· 22.4	287 07.4	·· 15.6	330 40.0	117	·11 09.6	−108
22	181 54.9	104 22.0	49.6	233 31.0	09.8	37 37.1	22.3	302 10.0	15.6	345 10.7	116	11 20.4	−107
23	196 57.3	119 22.1	49.9	248 31.8	09.4	52 39.5	22.3	317 12.7	15.6	359 41.3	116	11 31.1	−107
24	211 59.8	134 22.1	+26 50.2	263 32.6	−20 09.1	67 41.9	+15 22.3	332 15.3	−18 15.5	14 11.9	115	−11 41.8	−106
code	—	0	+ 3	+ 8	+ 4	+ 25	0	+ 26	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
21 00	180 18.3	+11 46.6
01	195 18.4	47.5
02	210 18.5	48.3
03	225 18.7	49.2
04	240 18.8	50.0
05	255 18.9	50.9
06	270 19.0	+11 51.7
07	285 19.2	52.6
08	300 19.3	53.4
09	315 19.4	54.3
10	330 19.6	55.1
11	345 19.7	56.0
12	0 19.8	+11 56.8
13	15 19.9	57.6
14	30 20.1	58.5
15	45 20.2	11 59.3
16	60 20.3	12 00.2
17	75 20.4	01.0
18	90 20.6	+12 01.9
19	105 20.7	02.7
20	120 20.8	03.6
21	135 21.0	04.4
22	150 21.1	05.2
23	165 21.2	06.1
22 00	180 21.3	+12 06.9
01	195 21.5	07.8
02	210 21.6	08.6
03	225 21.7	09.5
04	240 21.8	10.3
05	255 22.0	11.1
06	270 22.1	+12 12.0
07	285 22.2	12.8
08	300 22.3	13.7
09	315 22.4	14.5
10	330 22.6	15.3
11	345 22.7	16.2
12	0 22.8	+12 17.0
13	15 22.9	17.9
14	30 23.1	18.7
15	45 23.2	19.5
16	60 23.3	20.4
17	75 23.4	21.2
18	90 23.6	+12 22.0
19	105 23.7	22.9
20	120 23.8	23.7
21	135 23.9	24.5
22	150 24.0	25.4
23	165 24.2	26.2
23 00	180 24.3	+12 27.0
01	195 24.4	27.9
02	210 24.5	28.7
03	225 24.6	29.5
04	240 24.8	30.4
05	255 24.9	31.2
06	270 25.0	+12 32.0
07	285 25.1	32.9
08	300 25.2	33.7
09	315 25.4	34.5
10	330 25.5	35.4
11	345 25.6	36.2
12	0 25.7	+12 37.0
13	15 25.8	37.9
14	30 26.0	38.7
15	45 26.1	39.5
16	60 26.2	40.3
17	75 26.3	41.2
18	90 26.4	+12 42.0
19	105 26.5	42.8
20	120 26.7	43.7
21	135 26.8	44.5
22	150 26.9	45.3
23	165 27.0	46.1
24	180 27.1	+12 47.0
code	—	+ 9

No.	Name	STARS SHA	STARS Dec.
		° ′	° ′
7	Acamar	315 51.2	−40 28.8
5	Achernar	335 59.1	−57 27.4
30	Acrux	173 56.7	−62 51.7
19	Adhara	255 46.3	−28 55.0
10	Aldebaran	291 38.9	+16 25.3
32	Alioth	166 57.7	+56 11.8
34	Alkaid	153 32.1	+49 31.7
55	Al Na'ir	28 37.6	−47 10.2
15	Alnilam	276 30.1	− 1 13.8
25	Alphard	218 38.1	− 8 28.4
41	Alphecca	126 46.9	+26 51.5
1	Alpheratz	358 28.2	+28 50.9
51	Altair	62 50.0	+ 8 45.0
2	Ankaa	353 58.3	−42 32.5
42	Antares	113 18.5	−26 20.2
37	Arcturus	146 34.5	+19 24.4
43	Atria	108 58.5	−68 56.9
22	Avior	234 35.6	−59 22.5
13	Bellatrix	279 18.2	+ 6 18.6
16	Betelg'se	271 47.9	+ 7 23.9
17	Canopus	264 15.4	−52 40.6
12	Capella	281 38.1	+45 57.4
53	Deneb	50 00.7	+45 07.2
28	Denebola	183 17.0	+14 48.8
4	Diphda	349 39.1	−18 13.5
27	Dubhe	194 43.7	+61 59.3
14	Elnath	279 07.1	+28 34.3
47	Eltanin	91 05.7	+51 29.4
54	Enif	34 29.3	+ 9 40.4
56	Fomalhaut	16 11.4	−29 51.1
31	Gacrux	172 48.2	−56 52.4
29	Gienah	176 36.1	−17 18.2
35	Hadar	149 48.2	−60 09.9
6	Hamal	328 49.5	+23 15.4
48	Kaus Aust.	84 40.4	−34 24.3
40	Kochab	137 16.8	+74 19.9
57	Markab	14 21.2	+14 58.1
8	Menkar	315 00.2	+ 3 55.1
36	Menkent	148 57.8	−36 09.5
24	Miapl'dus	221 48.7	−69 32.7
9	Mirfak	309 42.2	+49 42.5
50	Nunki	76 51.2	−26 21.1
52	Peacock	54 26.6	−56 52.3
21	Pollux	244 20.1	+28 08.0
20	Procyon	245 44.6	+ 5 20.1
46	R'alhague	96 46.0	+12 35.3
26	Regulus	208 28.9	+12 10.7
11	Rigel	281 53.5	− 8 15.2
38	Rigil Kent.	140 49.7	−60 39.5
44	Sabik	103 01.4	−15 40.4
3	Schedar	350 30.0	+56 17.8
45	Shaula	97 19.8	−37 04.3
18	Sirius	259 11.6	−16 39.5
33	Spica	159 16.1	−10 56.2
23	Suhail	223 23.9	−43 15.7
49	Vega	81 07.8	+38 44.3
39	Zub'g'bi	137 52.6	−15 51.8

GMT	Equation of Time (App.—Mean) 21	22	23
h	m s	m s	m s
0	+ 1 12.8	+ 1 25.1	+ 1 36.9
6	+ 1 15.9	+ 1 28.1	+ 1 39.8
12	+ 1 19.0	+ 1 31.0	+ 1 42.6
18	+ 1 22.0	+ 1 34.0	+ 1 45.5
24	+ 1 25.1	+ 1 36.9	+ 1 48.3

Lat. N °	Sunrise h m	Twlt. begins h m
72	2 57	////
70	3 20	////
68	3 38	////
66	3 53	////
64	4 05	////
62	4 15	////
60	4 23	////
58	4 31	1 20
56	4 37	1 52
54	4 43	2 14
52	4 48	2 32
50	4 53	2 46
45	5 04	3 14
40	5 12	3 35
35	5 19	3 50
30	5 26	4 02
20	5 37	4 22
10	5 46	4 35
0	5 55	4 45
10	6 04	4 53
20	6 13	4 59
30	6 23	5 03
35	6 29	5 03
40	6 36	5 04
45	6 44	5 04
50	6 53	5 03
52	6 57	5 02
54	7 02	5 01
56	7 07	5 00
58	7 13	4 59
60	7 19	4 57

Lat. S °	Sunset h m	Twlt. ends h m
72	21 05	////
70	20 40	////
68	20 22	////
66	20 07	////
64	19 55	////
62	19 44	////
60	19 36	////
58	19 28	22 47
56	19 21	22 12
54	19 15	21 48
52	19 10	21 30
50	19 05	21 15
45	18 54	20 46
40	18 46	20 26
35	18 38	20 09
30	18 32	19 57
20	18 20	19 36
10	18 11	19 23
0	18 02	19 12
10	17 53	19 04
20	17 44	18 58
30	17 33	18 53
35	17 27	18 52
40	17 21	18 52
45	17 13	18 51
50	17 03	18 51
52	16 59	18 52
54	16 54	18 53
56	16 49	18 54
58	16 43	18 55
60	16 37	18 57

Lat. N °	Moonrise 21	22	23	24
	h m	h m	h m	h m
72	15 19	17 18	19 21	21 37
70	15 18	17 09	19 02	20 59
68	15 18	17 02	18 47	20 33
66	15 17	16 56	18 35	20 13
64	15 17	16 51	18 25	19 57
62	15 17	16 47	18 16	19 44
60	15 16	16 43	18 09	19 33
58	15 16	16 40	18 03	19 24
56	15 16	16 37	17 57	19 15
54	15 16	16 34	17 52	19 08
52	15 16	16 32	17 47	19 01
50	15 15	16 30	17 43	18 55
45	15 15	16 25	17 34	18 42
40	15 15	16 21	17 27	18 32
35	15 15	16 18	17 21	18 23
30	15 14	16 15	17 15	18 15
20	15 14	16 10	17 06	18 01
10	15 14	16 06	16 57	17 49
0	15 14	16 02	16 50	17 38
10	15 13	15 57	16 42	17 28
20	15 13	15 53	16 34	17 16
30	15 13	15 48	16 25	17 03
35	15 13	15 46	16 20	16 55
40	15 13	15 43	16 14	16 47
45	15 12	15 39	16 07	16 37
50	15 12	15 35	15 59	16 25
52	15 12	15 33	15 55	16 19
54	15 12	15 31	15 51	16 13
56	15 12	15 28	15 46	16 07
58	15 12	15 26	15 41	15 59
60	15 12	15 23	15 36	15 50

Lat. N °	Moonset 21	22	23	24
	h m	h m	h m	h m
72	3 15	2 59	2 41	2 20
70	3 13	3 03	2 53	2 41
68	3 10	3 06	3 02	2 58
66	3 08	3 09	3 10	3 11
64	3 06	3 11	3 16	3 23
62	3 05	3 13	3 22	3 32
60	3 04	3 15	3 27	3 40
58	3 03	3 17	3 31	3 48
56	3 02	3 18	3 35	3 54
54	3 01	3 20	3 39	4 00
52	3 00	3 21	3 42	4 05
50	2 59	3 22	3 45	4 10
45	2 57	3 24	3 51	4 20
40	2 56	3 26	3 57	4 29
35	2 55	3 28	4 01	4 36
30	2 53	3 29	4 05	4 42
20	2 52	3 32	4 12	4 54
10	2 50	3 34	4 19	5 04
0	2 48	3 36	4 24	5 13
10	2 46	3 39	4 30	5 22
20	2 44	3 41	4 37	5 32
30	2 42	3 43	4 44	5 44
35	2 41	3 45	4 48	5 50
40	2 40	3 47	4 53	5 58
45	2 38	3 49	4 58	6 07
50	2 36	3 51	5 05	6 18
52	2 35	3 52	5 08	6 23
54	2 34	3 53	5 11	6 28
56	2 33	3 55	5 15	6 34
58	2 32	3 56	5 19	6 41
60	2 30	3 58	5 24	6 49

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
21	21 25	15 03	6 29	19 38	2 03
22	22 13	15 03	6 28	19 34	1 59
23	23 01	15 03	6 27	19 30	1 55
24	23 50	15 03	6 26	19 26	1 51

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.2	0.2	0.1
30	0.2	0.2	0.1
45	0.2	0.1	0.1
60	0.2	0.1	0.1
75	0.2	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt. °	21 ′	22 ′	23 ′
0	17.1	16.4	15.8
4	17.1	16.4	15.8
8	17.1	16.4	15.8
12	17.0	16.4	15.8
16	17.0	16.4	15.8
20	17.0	16.4	15.8
24	17.0	16.4	15.8
28	16.9	16.3	15.8
32	16.9	16.3	15.8
36	16.8	16.3	15.8
40	16.8	16.3	15.8
44	16.7	16.2	15.7
48	16.6	16.2	15.7
52	16.6	16.2	15.7
56	16.5	16.1	15.7
60	16.4	16.1	15.7
64	16.4	16.0	15.7
68	16.3	16.0	15.7
72	16.2	15.9	15.7
76	16.1	15.9	15.6
80	16.0	15.8	15.6
84	16.0	15.8	15.6
88	15.9	15.8	15.6
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt. °	21 ′	22 ′	23 ′
0	14.7	15.0	15.4
4	14.7	15.0	15.4
8	14.7	15.1	15.4
12	14.7	15.1	15.4
16	14.7	15.1	15.4
20	14.8	15.1	15.4
24	14.8	15.1	15.4
28	14.8	15.1	15.4
32	14.9	15.2	15.4
36	14.9	15.2	15.4
40	15.0	15.2	15.5
44	15.0	15.3	15.5
48	15.1	15.3	15.5
52	15.2	15.3	15.5
56	15.2	15.4	15.5
60	15.3	15.4	15.5
64	15.4	15.5	15.5
68	15.5	15.5	15.5
72	15.5	15.5	15.6
76	15.6	15.6	15.6
80	15.7	15.6	15.6
84	15.8	15.7	15.6
88	15.9	15.7	15.6
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −4.1 GHA	VENUS −4.1 Dec.	MARS 0.4 GHA	MARS 0.4 Dec.	JUPITER −1.8 GHA	JUPITER −1.8 Dec.	SATURN 0.4 GHA	SATURN 0.4 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
24 0	211 59.8	134 22.1	+26 50.2	263 32.6	−20 09.1	67 41.9	+15 22.3	332 15.3	−18 15.5	14 11.9	115	−11 41.8	−106
1	227 02.3	149 22.1	50.4	278 33.4	08.8	82 44.4	22.3	347 17.9	15.5	28 42.4	116	11 52.4	−106
2	242 04.7	164 22.2	50.7	293 34.2	08.5	97 46.8	22.3	2 20.5	15.5	43 13.0	115	12 03.0	−104
3	257 07.2	179 22.2	·· 51.0	308 35.0	·· 08.2	112 49.2	·· 22.2	17 23.1	·· 15.4	57 43.5	115	·12 13.4	−104
4	272 09.7	194 22.2	51.2	323 35.9	07.8	127 51.6	22.2	32 25.8	15.4	72 14.0	115	12 23.8	−104
5	287 12.1	209 22.3	51.5	338 36.7	07.5	142 54.0	22.2	47 28.4	15.4	86 44.5	115	12 34.2	−102
6	302 14.6	224 22.3	+26 51.7	353 37.5	−20 07.2	157 56.4	+15 22.2	62 31.0	−18 15.3	101 15.0	115	−12 44.4	−102
7	317 17.0	239 22.4	52.0	8 38.3	06.9	172 58.9	22.2	77 33.6	15.3	115 45.5	114	12 54.6	−101
8	332 19.5	254 22.4	52.3	23 39.1	06.6	188 01.3	22.1	92 36.2	15.3	130 15.9	114	13 04.7	−101
9	347 22.0	269 22.4	·· 52.5	38 39.9	·· 06.2	203 03.7	·· 22.1	107 38.9	·· 15.2	144 46.3	115	·13 14.8	− 99
10	2 24.4	284 22.5	52.8	53 40.8	05.9	218 06.1	22.1	122 41.5	15.2	159 16.8	113	13 24.7	− 99
11	17 26.9	299 22.5	53.0	68 41.6	05.6	233 08.5	22.1	137 44.1	15.2	173 47.1	114	13 34.6	− 99
12	32 29.4	314 22.6	+26 53.3	83 42.4	−20 05.3	248 10.9	+15 22.0	152 46.7	−18 15.1	188 17.5	113	−13 44.5	− 97
13	47 31.8	329 22.6	53.5	98 43.2	04.9	263 13.3	22.0	167 49.4	15.1	202 47.8	114	13 54.2	− 97
14	62 34.3	344 22.7	53.8	113 44.0	04.6	278 15.8	22.0	182 52.0	15.1	217 18.2	113	14 03.9	− 95
15	77 36.8	359 22.7	·· 54.0	128 44.8	·· 04.3	293 18.2	·· 22.0	197 54.6	·· 15.0	231 48.5	112	·14 13.4	− 95
16	92 39.2	14 22.8	54.3	143 45.7	04.0	308 20.6	22.0	212 57.2	15.0	246 18.7	113	14 22.9	− 95
17	107 41.7	29 22.8	54.5	158 46.5	03.6	323 23.0	21.9	227 59.9	15.0	260 49.0	112	14 32.4	− 93
18	122 44.1	44 22.9	+26 54.8	173 47.3	−20 03.3	338 25.4	+15 21.9	243 02.5	−18 14.9	275 19.2	113	−14 41.7	− 93
19	137 46.6	59 22.9	55.0	188 48.1	03.0	353 27.8	21.9	258 05.1	14.9	289 49.5	111	14 51.0	− 92
20	152 49.1	74 23.0	55.3	203 48.9	02.7	8 30.2	21.9	273 07.7	14.9	304 19.6	112	15 00.2	− 90
21	167 51.5	89 23.0	·· 55.5	218 49.8	·· 02.3	23 32.6	·· 21.8	288 10.3	·· 14.8	318 49.8	112	·15 09.2	− 91
22	182 54.0	104 23.1	55.7	233 50.6	02.0	38 35.0	21.8	303 13.0	14.8	333 20.0	111	15 18.3	− 89
23	197 56.5	119 23.2	56.0	248 51.4	01.7	53 37.5	21.8	318 15.6	14.8	347 50.1	111	15 27.2	− 88
25 0	212 58.9	134 23.2	+26 56.2	263 52.2	−20 01.4	68 39.9	+15 21.8	333 18.2	−18 14.7	2 20.2	111	−15 36.0	− 88
1	228 01.4	149 23.3	56.5	278 53.0	01.0	83 42.3	21.7	348 20.8	14.7	16 50.3	111	15 44.8	− 87
2	243 03.9	164 23.3	56.7	293 53.9	00.7	98 44.7	21.7	3 23.5	14.7	31 20.4	110	15 53.5	− 85
3	258 06.3	179 23.4	·· 56.9	308 54.7	·· 00.4	113 47.1	·· 21.7	18 26.1	·· 14.6	45 50.4	111	·16 02.0	− 85
4	273 08.8	194 23.5	57.2	323 55.5	20 00.1	128 49.5	21.7	33 28.7	14.6	60 20.5	110	16 10.5	− 84
5	288 11.3	209 23.5	57.4	338 56.3	19 59.7	143 51.9	21.7	48 31.3	14.6	74 50.5	110	16 18.9	− 84
6	303 13.7	224 23.6	+26 57.7	353 57.1	−19 59.4	158 54.3	+15 21.6	63 34.0	−18 14.5	89 20.5	109	−16 27.3	− 82
7	318 16.2	239 23.7	57.9	8 58.0	59.1	173 56.7	21.6	78 36.6	14.5	103 50.4	110	16 35.5	− 81
8	333 18.6	254 23.7	58.1	23 58.8	58.8	188 59.1	21.6	93 39.2	14.4	118 20.4	109	16 43.6	− 81
9	348 21.1	269 23.8	·· 58.4	38 59.6	·· 58.4	204 01.5	·· 21.6	108 41.8	·· 14.4	132 50.3	109	·16 51.7	− 79
10	3 23.6	284 23.9	58.6	54 00.4	58.1	219 03.9	21.5	123 44.5	14.4	147 20.2	109	16 59.6	− 79
11	18 26.0	299 23.9	58.8	69 01.2	57.8	234 06.4	21.5	138 47.1	14.3	161 50.1	109	17 07.5	− 77
12	33 28.5	314 24.0	+26 59.1	84 02.1	−19 57.5	249 08.8	+15 21.5	153 49.7	−18 14.3	176 20.0	109	−17 15.2	− 77
13	48 31.0	329 24.1	59.3	99 02.9	57.1	264 11.2	21.5	168 52.3	14.3	190 49.9	108	17 22.9	− 76
14	63 33.4	344 24.2	59.5	114 03.7	56.8	279 13.6	21.4	183 55.0	14.2	205 19.7	108	17 30.5	− 74
15	78 35.9	359 24.3	·26 59.7	129 04.5	·· 56.5	294 16.0	·· 21.4	198 57.6	·· 14.2	219 49.5	108	·17 37.9	− 74
16	93 38.4	14 24.3	27 00.0	144 05.4	56.1	309 18.4	21.4	214 00.2	14.2	234 19.3	108	17 45.3	− 73
17	108 40.8	29 24.4	00.2	159 06.2	55.8	324 20.8	21.4	229 02.8	14.1	248 49.1	107	17 52.6	− 72
18	123 43.3	44 24.5	+27 00.4	174 07.0	−19 55.5	339 23.2	+15 21.3	244 05.5	−18 14.1	263 18.8	108	−17 59.8	− 71
19	138 45.8	59 24.6	00.6	189 07.8	55.2	354 25.6	21.3	259 08.1	14.1	277 48.6	107	18 06.9	− 70
20	153 48.2	74 24.7	00.9	204 08.7	54.8	9 28.0	21.3	274 10.7	14.0	292 18.3	107	18 13.9	− 69
21	168 50.7	89 24.7	·· 01.1	219 09.5	·· 54.5	24 30.4	·· 21.3	289 13.3	·· 14.0	306 48.0	107	·18 20.8	− 68
22	183 53.1	104 24.8	01.3	234 10.3	54.2	39 32.8	21.2	304 16.0	14.0	321 17.7	107	18 27.6	− 67
23	198 55.6	119 24.9	01.5	249 11.1	53.8	54 35.2	21.2	319 18.6	13.9	335 47.4	107	18 34.3	− 66
26 0	213 58.1	134 25.0	+27 01.7	264 11.9	−19 53.5	69 37.6	+15 21.2	334 21.2	−18 13.9	350 17.1	106	−18 40.9	− 65
1	229 00.5	149 25.1	02.0	279 12.8	53.2	84 40.0	21.1	349 23.9	13.9	4 46.7	106	18 47.4	− 64
2	244 03.0	164 25.2	02.2	294 13.6	52.8	99 42.4	21.1	4 26.5	13.8	19 16.3	106	18 53.8	− 63
3	259 05.5	179 25.3	·· 02.4	309 14.4	·· 52.5	114 44.8	·· 21.1	19 29.1	·· 13.8	33 45.9	107	·19 00.1	− 62
4	274 07.9	194 25.4	02.6	324 15.2	52.2	129 47.2	21.1	34 31.7	13.8	48 15.6	105	19 06.3	− 60
5	289 10.4	209 25.5	02.8	339 16.1	51.9	144 49.6	21.0	49 34.4	13.7	62 45.1	106	19 12.3	− 60
6	304 12.9	224 25.6	+27 03.0	354 16.9	−19 51.5	159 52.0	+15 21.0	64 37.0	−18 13.7	77 14.7	106	−19 18.3	− 59
7	319 15.3	239 25.6	03.3	9 17.7	51.2	174 54.4	21.0	79 39.6	13.7	91 44.3	105	19 24.2	− 58
8	334 17.8	254 25.7	03.5	24 18.6	50.9	189 56.8	21.0	94 42.2	13.6	106 13.8	106	19 30.0	− 57
9	349 20.2	269 25.8	·· 03.7	39 19.4	·· 50.5	204 59.2	·· 20.9	109 44.9	·· 13.6	120 43.4	105	·19 35.7	− 55
10	4 22.7	284 25.9	03.9	54 20.2	50.2	220 01.6	20.9	124 47.5	13.6	135 12.9	105	19 41.2	− 55
11	19 25.2	299 26.0	04.1	69 21.0	49.9	235 04.0	20.9	139 50.1	13.5	149 42.4	105	19 46.7	− 54
12	34 27.6	314 26.1	+27 04.3	84 21.9	−19 49.5	250 06.4	+15 20.9	154 52.7	−18 13.5	164 11.9	105	−19 52.1	− 52
13	49 30.1	329 26.3	04.5	99 22.7	49.2	265 08.8	20.8	169 55.4	13.5	178 41.4	105	19 57.3	− 52
14	64 32.6	344 26.4	04.7	114 23.5	48.9	280 11.2	20.8	184 58.0	13.4	193 10.9	105	20 02.5	− 50
15	79 35.0	359 26.5	·· 04.9	129 24.3	·· 48.5	295 13.6	·· 20.8	200 00.6	·· 13.4	207 40.4	104	·20 07.5	− 49
16	94 37.5	14 26.6	05.1	144 25.2	48.2	310 16.0	20.7	215 03.3	13.4	222 09.8	105	20 12.4	− 49
17	109 40.0	29 26.7	05.3	159 26.0	47.9	325 18.4	20.7	230 05.9	13.3	236 39.3	104	20 17.3	− 47
18	124 42.4	44 26.8	+27 05.5	174 26.8	−19 47.5	340 20.8	+15 20.7	245 08.5	−18 13.3	251 08.7	105	−20 22.0	− 46
19	139 44.9	59 26.9	05.7	189 27.7	47.2	355 23.2	20.7	260 11.1	13.3	265 38.2	104	20 26.6	− 45
20	154 47.4	74 27.0	05.9	204 28.5	46.9	10 25.6	20.6	275 13.8	13.2	280 07.6	105	20 31.1	− 44
21	169 49.8	89 27.1	·· 06.1	219 29.3	·· 46.5	25 28.0	·· 20.6	290 16.4	·· 13.2	294 37.1	104	·20 35.5	− 43
22	184 52.3	104 27.2	06.3	234 30.1	46.2	40 30.4	20.6	305 19.0	13.1	309 06.5	104	20 39.8	− 42
23	199 54.7	119 27.4	06.5	249 31.0	45.9	55 32.8	20.5	320 21.7	13.1	323 35.9	104	20 44.0	− 41
24	214 57.2	134 27.5	+27 06.7	264 31.8	−19 45.5	70 35.2	+15 20.5	335 24.3	−18 13.1	338 05.3	105	−20 48.1	− 39
code	—	+ 1	+ 2	+ 8	+ 4	+ 24	0	+ 26	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
24 0	180 27.1	+12 47.0
1	195 27.2	47.8
2	210 27.4	48.6
3	225 27.5	·· 49.4
4	240 27.6	50.3
5	255 27.7	51.1
6	270 27.8	+12 51.9
7	285 27.9	52.7
8	300 28.0	53.6
9	315 28.2	·· 54.4
10	330 28.3	55.2
11	345 28.4	56.0
12	0 28.5	+12 56.8
13	15 28.6	57.7
14	30 28.7	58.5
15	45 28.8	·12 59.3
16	60 29.0	13 00.1
17	75 29.1	00.9
18	90 29.2	+13 01.8
19	105 29.3	02.6
20	120 29.4	03.4
21	135 29.5	·· 04.2
22	150 29.6	05.0
23	165 29.7	05.8
25 0	180 29.9	+13 06.7
1	195 30.0	07.5
2	210 30.1	08.3
3	225 30.2	·· 09.1
4	240 30.3	09.9
5	255 30.4	10.7
6	270 30.5	+13 11.6
7	285 30.6	12.4
8	300 30.7	13.2
9	315 30.8	·· 14.0
10	330 31.0	14.8
11	345 31.1	15.6
12	0 31.2	+13 16.4
13	15 31.3	17.2
14	30 31.4	18.1
15	45 31.5	·· 18.9
16	60 31.6	19.7
17	75 31.7	20.5
18	90 31.8	+13 21.3
19	105 31.9	22.1
20	120 32.0	22.9
21	135 32.1	·· 23.7
22	150 32.3	24.5
23	165 32.4	25.3
26 0	180 32.5	+13 26.1
1	195 32.6	27.0
2	210 32.7	27.8
3	225 32.8	·· 28.6
4	240 32.9	29.4
5	255 33.0	30.2
6	270 33.1	+13 31.0
7	285 33.2	31.8
8	300 33.3	32.6
9	315 33.4	·· 33.4
10	330 33.5	34.2
11	345 33.6	35.0
12	0 33.7	+13 35.8
13	15 33.8	36.6
14	30 33.9	37.4
15	45 34.0	·· 38.2
16	60 34.1	39.0
17	75 34.2	39.8
18	90 34.3	+13 40.6
19	105 34.4	41.4
20	120 34.5	42.2
21	135 34.6	·· 43.0
22	150 34.7	43.8
23	165 34.8	44.6
24	180 34.9	+13 45.4
code	—	+ 8

STARS No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 51.2	−40 28.8
5	Achernar	335 59.1	−57 27.4
30	Acrux	173 56.7	−62 51.7
19	Adhara	255 46.3	−28 55.0
10	Aldebaran	291 38.9	+16 25.3
32	Alioth	166 57.7	+56 11.8
34	Alkaid	153 32.1	+49 31.8
55	Al Na'ir	28 37.6	−47 10.2
15	Alnilam	276 30.1	− 1 13.8
25	Alphard	218 38.1	− 8 28.4
41	Alphecca	126 46.9	+26 51.5
1	Alpheratz	358 28.2	+28 50.9
51	Altair	62 49.9	+ 8 45.0
2	Ankaa	353 58.3	−42 32.4
42	Antares	113 18.5	−26 20.2
37	Arcturus	146 34.5	+19 24.4
43	Atria	108 58.4	−68 56.9
22	Avior	234 35.6	−59 22.5
13	Bellatrix	279 18.2	+ 6 18.6
16	Betelg'se	271 47.9	+ 7 23.9
17	Canopus	264 15.5	−52 40.6
12	Capella	281 38.1	+45 57.4
53	Deneb	50 00.7	+45 07.2
28	Denebola	183 17.1	+14 48.8
4	Diphda	349 39.1	−18 13.5
27	Dubhe	194 43.7	+61 59.3
14	Elnath	279 07.1	+28 34.3
47	Eltanin	91 05.7	+51 29.4
54	Enif	34 29.3	+ 9 40.4
56	Fomalhaut	16 11.4	−29 51.1
31	Gacrux	172 48.2	−56 52.4
29	Gienah	176 36.1	−17 18.2
35	Hadar	149 48.1	−60 09.9
6	Hamal	328 49.5	+23 15.4
48	Kaus Aust.	84 40.4	−34 24.3
40	Kochab	137 16.8	+74 20.0
57	Markab	14 21.2	+14 58.1
8	Menkar	315 00.2	+ 3 55.1
36	Menkent	148 57.8	−36 09.5
24	Miapl'dus	221 48.7	−69 32.7
9	Mirfak	309 42.2	+49 42.5
50	Nunki	76 51.2	−26 21.1
52	Peacock	54 26.6	−56 52.3
21	Pollux	244 20.1	+28 08.0
20	Procyon	245 44.6	+ 5 20.1
46	R'alhague	96 46.0	+12 35.3
26	Regulus	208 28.9	+12 10.7
11	Rigel	281 53.5	− 8 15.2
38	Rigil Kent.	140 49.7	−60 39.5
44	Sabik	103 01.4	−15 40.4
3	Schedar	350 30.0	+56 17.8
45	Shaula	97 19.8	−37 04.4
18	Sirius	259 11.6	−16 39.5
33	Spica	159 16.1	−10 56.2
23	Suhail	223 23.9	−43 15.7
49	Vega	81 07.8	+38 44.3
39	Zub'g'bi	137 52.6	−15 51.8

Lat. N °	Sunrise h m	Twlt. begins h m
72	2 37	////
70	3 04	////
68	3 25	////
66	3 41	////
64	3 54	////
62	4 05	////
60	4 15	////
58	4 23	0 53
56	4 30	1 35
54	4 36	2 02
52	4 42	2 21
50	4 47	2 37
45	4 59	3 07
40	5 08	3 28
35	5 16	3 45
30	5 23	3 59
20	5 35	4 18
10	5 45	4 33
0	5 55	4 44
10	6 04	4 53
20	6 14	5 00
30	6 25	5 04
35	6 32	5 06
40	6 39	5 07
45	6 47	5 07
50	6 58	5 07
52	7 02	5 07
54	7 08	5 07
56	7 13	5 06
58	7 20	5 04
60 S	7 27	5 03

Moonrise	24	25	26	27
Lat. N °	h m	h m	h m	h m
72	21 37	▬	▬	▬
70	20 59	23 11	▬	▬
68	20 33	22 21	24 13	0 13
66	20 13	21 50	23 22	24 38
64	19 57	21 27	22 50	24 00
62	19 44	21 09	22 27	23 33
60	19 33	20 54	22 08	23 12
58	19 24	20 41	21 53	22 55
56	19 15	20 30	21 40	22 41
54	19 08	20 21	21 28	22 28
52	19 01	20 12	21 18	22 17
50	18 55	20 04	21 09	22 07
45	18 42	19 48	20 50	21 47
40	18 32	19 35	20 35	21 31
35	18 23	19 23	20 22	21 17
30	18 15	19 13	20 10	21 05
20	18 01	18 57	19 51	20 44
10	17 49	18 42	19 34	20 26
0	17 38	18 28	19 19	20 09
10	17 28	18 15	19 03	19 52
20	17 16	18 00	18 46	19 35
30	17 03	17 44	18 27	19 14
35	16 55	17 34	18 16	19 02
40	16 47	17 23	18 04	18 48
45	16 37	17 10	17 49	18 32
50	16 25	16 55	17 30	18 12
52	16 19	16 48	17 22	18 03
54	16 13	16 40	17 12	17 52
56	16 07	16 31	17 01	17 40
58	15 59	16 21	16 49	17 26
60 S	15 50	16 09	16 35	17 10

Lat. N °	Sunset h m	Twlt. ends h m
72	21 24	////
70	20 55	////
68	20 34	////
66	20 18	////
64	20 04	////
62	19 53	////
60	19 43	////
58	19 35	23 15
56	19 27	22 27
54	19 21	22 00
52	19 15	21 39
50	19 09	21 22
45	18 58	20 52
40	18 49	20 30
35	18 41	20 13
30	18 33	19 59
20	18 21	19 38
10	18 11	19 23
0	18 01	19 12
10	17 52	19 03
20	17 42	18 56
30	17 30	18 51
35	17 24	18 49
40	17 16	18 47
45	17 08	18 47
50	16 58	18 47
52	16 53	18 47
54	16 48	18 47
56	16 42	18 48
58	16 35	18 48
60 S	16 28	18 49

Moonset	24	25	26	27
Lat. N °	h m	h m	h m	h m
72	2 20	1 47	▬	▬
70	2 41	2 26	1 59	▬
68	2 58	2 53	2 49	2 43
66	3 11	3 14	3 21	3 34
64	3 23	3 31	3 44	4 06
62	3 32	3 45	4 03	4 30
60	3 40	3 57	4 19	4 49
58	3 48	4 07	4 32	5 04
56	3 54	4 16	4 43	5 18
54	4 00	4 24	4 53	5 29
52	4 05	4 31	5 02	5 40
50	4 10	4 38	5 10	5 49
45	4 20	4 52	5 28	6 08
40	4 29	5 03	5 42	6 24
35	4 36	5 13	5 54	6 38
30	4 42	5 22	6 04	6 49
20	4 54	5 37	6 22	7 09
10	5 04	5 50	6 38	7 27
0	5 13	6 02	6 52	7 43
10	5 22	6 15	7 07	7 59
20	5 32	6 28	7 23	8 17
30	5 44	6 43	7 41	8 37
35	5 50	6 52	7 52	8 48
40	5 58	7 02	8 04	9 02
45	6 07	7 14	8 18	9 18
50	6 18	7 28	8 36	9 38
52	6 23	7 35	8 44	9 47
54	6 28	7 43	8 53	9 57
56	6 34	7 51	9 04	10 09
58	6 41	8 01	9 16	10 23
60 S	6 49	8 11	9 30	10 39

GMT	Equation of Time (App.−Mean) 24	25	26
h	m s	m s	m s
0	+ 1 48.3	+ 1 59.2	+ 2 09.6
6	+ 1 51.0	+ 2 01.9	+ 2 12.2
12	+ 1 53.8	+ 2 04.5	+ 2 14.7
18	+ 1 56.5	+ 2 07.1	+ 2 17.1
24	+ 1 59.2	+ 2 09.6	+ 2 19.6

GMT of Transit Meridian of Greenwich	Moon	Venus	Mars	Jupiter	Saturn
DAY	h m	h m	h m	h m	h m
24	23 50	15 03	6 26	19 26	1 51
25	24 40	15 02	6 24	19 22	1 47
26	0 40	15 02	6 23	19 18	1 42
27	1 31	15 02	6 22	19 15	1 38

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.2	0.2	0.1
30	0.2	0.2	0.1
45	0.2	0.1	0.1
60	0.2	0.1	0.1
75	0.2	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	24	25	26
°	′	′	′
0	15.2	14.5	13.9
4	15.2	14.5	13.9
8	15.2	14.5	13.9
12	15.2	14.6	13.9
16	15.2	14.6	14.0
20	15.2	14.6	14.0
24	15.2	14.6	14.0
28	15.2	14.6	14.1
32	15.2	14.7	14.1
36	15.2	14.7	14.2
40	15.2	14.7	14.2
44	15.3	14.8	14.3
48	15.3	14.8	14.4
52	15.3	14.9	14.4
56	15.3	14.9	14.5
60	15.3	15.0	14.6
64	15.3	15.0	14.7
68	15.4	15.1	14.8
72	15.4	15.1	14.8
76	15.4	15.2	14.9
80	15.4	15.2	15.0
84	15.4	15.3	15.1
88	15.5	15.3	15.2
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	24	25	26
°	′	′	′
0	15.8	16.1	16.5
4	15.8	16.1	16.5
8	15.8	16.1	16.5
12	15.8	16.1	16.5
16	15.8	16.1	16.4
20	15.7	16.1	16.4
24	15.7	16.1	16.4
28	15.7	16.0	16.3
32	15.7	16.0	16.3
36	15.7	16.0	16.2
40	15.7	15.9	16.2
44	15.7	15.9	16.1
48	15.7	15.8	16.0
52	15.6	15.8	16.0
56	15.6	15.8	15.9
60	15.6	15.7	15.8
64	15.6	15.7	15.7
68	15.6	15.6	15.6
72	15.6	15.6	15.6
76	15.5	15.5	15.5
80	15.5	15.4	15.4
84	15.5	15.4	15.3
88	15.5	15.3	15.2
90			

Subtract from table, back cover

Full Moon 25

GMT	♈ GHA	VENUS −4.1 GHA	VENUS −4.1 Dec.	MARS 0.3 GHA	MARS 0.3 Dec.	JUPITER −1.8 GHA	JUPITER −1.8 Dec.	SATURN 0.3 GHA	SATURN 0.3 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
27 0	214 57.2	134 27.5	+27 06.7	264 31.8	−19 45.5	70 35.2	+15 20.5	335 24.3	−18 13.1	338 05.3	105	−20 48.1	− 39
1	229 59.7	149 27.6	06.9	279 32.6	45.2	85 37.6	20.5	350 26.9	13.0	352 34.8	104	20 52.0	− 39
2	245 02.1	164 27.7	07.1	294 33.5	44.9	100 40.0	20.5	5 29.5	13.0	7 04.2	104	20 55.9	− 37
3	260 04.6	179 27.8	07.3	309 34.3	44.5	115 42.4	20.4	20 32.2	13.0	21 33.6	104	·20 59.6	− 37
4	275 07.1	194 28.0	07.5	324 35.1	44.2	130 44.8	20.4	35 34.8	12.9	36 03.0	104	21 03.3	− 35
5	290 09.5	209 28.1	07.7	339 36.0	43.9	145 47.1	20.4	50 37.4	12.9	50 32.4	104	21 06.8	− 34
6	305 12.0	224 28.2	+27 07.9	354 36.8	−19 43.5	160 49.5	+15 20.3	65 40.1	−18 12.9	65 01.8	104	−21 10.2	− 33
7	320 14.5	239 28.3	08.1	9 37.6	43.2	175 51.9	20.3	80 42.7	12.8	79 31.2	105	21 13.5	− 32
8	335 16.9	254 28.5	08.3	24 38.4	42.9	190 54.3	20.3	95 45.3	12.8	94 00.7	104	21 16.7	− 31
9	350 19.4	269 28.6	08.5	39 39.3	42.5	205 56.7	20.3	110 47.9	12.8	108 30.1	104	·21 19.8	− 30
10	5 21.9	284 28.7	08.7	54 40.1	42.2	220 59.1	20.2	125 50.6	12.7	122 59.5	104	21 22.8	− 29
11	20 24.3	299 28.9	08.8	69 40.9	41.9	236 01.5	20.2	140 53.2	12.7	137 28.9	105	21 25.7	− 27
12	35 26.8	314 29.0	+27 09.0	84 41.8	−19 41.5	251 03.9	+15 20.2	155 55.8	−18 12.7	151 58.4	104	−21 28.4	− 27
13	50 29.2	329 29.1	09.2	99 42.6	41.2	266 06.3	20.1	170 58.5	12.6	166 27.8	104	21 31.1	− 25
14	65 31.7	344 29.3	09.4	114 43.4	40.8	281 08.7	20.1	186 01.1	12.6	180 57.2	105	21 33.6	− 24
15	80 34.2	359 29.4	09.6	129 44.3	40.5	296 11.1	20.1	201 03.7	12.6	195 26.7	104	·21 36.0	− 23
16	95 36.6	14 29.5	09.8	144 45.1	40.2	311 13.5	20.1	216 06.4	12.5	209 56.1	105	21 38.3	− 22
17	110 39.1	29 29.7	09.9	159 45.9	39.8	326 15.8	20.0	231 09.0	12.5	224 25.6	104	21 40.5	− 21
18	125 41.6	44 29.8	+27 10.1	174 46.8	−19 39.5	341 18.2	+15 20.0	246 11.6	−18 12.5	238 55.0	105	−21 42.6	− 20
19	140 44.0	59 30.0	10.3	189 47.6	39.2	356 20.6	20.0	261 14.2	12.4	253 24.5	105	21 44.6	− 19
20	155 46.5	74 30.1	10.5	204 48.4	38.8	11 23.0	19.9	276 16.9	12.4	267 54.0	105	21 46.5	− 18
21	170 49.0	89 30.2	10.7	219 49.3	38.5	26 25.4	19.9	291 19.5	12.4	282 23.5	105	·21 48.3	− 16
22	185 51.4	104 30.4	10.8	234 50.1	38.1	41 27.8	19.9	306 22.1	12.3	296 53.0	105	21 49.9	− 15
23	200 53.9	119 30.5	11.0	249 50.9	37.8	56 30.2	19.8	321 24.8	12.3	311 22.5	105	21 51.4	− 15
28 0	215 56.3	134 30.7	+27 11.2	264 51.8	−19 37.5	71 32.6	+15 19.8	336 27.4	−18 12.2	325 52.0	106	−21 52.9	− 13
1	230 58.8	149 30.8	11.4	279 52.6	37.1	86 35.0	19.8	351 30.0	12.2	340 21.6	105	21 54.2	− 12
2	246 01.3	164 31.0	11.5	294 53.4	36.8	101 37.3	19.7	6 32.7	12.2	354 51.1	106	21 55.4	− 11
3	261 03.7	179 31.1	11.7	309 54.3	36.5	116 39.7	19.7	21 35.3	12.1	9 20.7	106	·21 56.5	− 10
4	276 06.2	194 31.3	11.9	324 55.1	36.1	131 42.1	19.7	36 37.9	12.1	23 50.3	106	21 57.5	− 9
5	291 08.7	209 31.4	12.1	339 55.9	35.8	146 44.5	19.7	51 40.6	12.1	38 19.9	106	21 58.4	− 8
6	306 11.1	224 31.6	+27 12.2	354 56.8	−19 35.4	161 46.9	+15 19.6	66 43.2	−18 12.0	52 49.5	106	−21 59.2	− 6
7	321 13.6	239 31.8	12.4	9 57.6	35.1	176 49.3	19.6	81 45.8	12.0	67 19.1	107	21 59.8	− 6
8	336 16.1	254 31.9	12.6	24 58.5	34.8	191 51.7	19.6	96 48.4	12.0	81 48.8	107	22 00.4	− 4
9	351 18.5	269 32.1	12.7	39 59.3	34.4	206 54.0	19.5	111 51.1	11.9	96 18.5	107	·22 00.8	− 3
10	6 21.0	284 32.2	12.9	55 00.1	34.1	221 56.4	19.5	126 53.7	11.9	110 48.2	107	22 01.1	− 3
11	21 23.5	299 32.4	13.1	70 01.0	33.7	236 58.8	19.5	141 56.3	11.9	125 17.9	107	22 01.4	− 1
12	36 25.9	314 32.6	+27 13.2	85 01.8	−19 33.4	252 01.2	+15 19.4	156 59.0	−18 11.8	139 47.6	107	−22 01.5	0
13	51 28.4	329 32.7	13.4	100 02.6	33.1	267 03.6	19.4	172 01.6	11.8	154 17.3	108	22 01.5	+ 1
14	66 30.8	344 32.9	13.6	115 03.5	32.7	282 06.0	19.4	187 04.2	11.8	168 47.1	108	22 01.4	+ 2
15	81 33.3	359 33.1	13.7	130 04.3	32.4	297 08.3	19.3	202 06.9	11.7	183 16.9	108	·22 01.2	+ 3
16	96 35.8	14 33.2	13.9	145 05.2	32.0	312 10.7	19.3	217 09.5	11.7	197 46.7	108	22 00.9	+ 5
17	111 38.2	29 33.4	14.0	160 06.0	31.7	327 13.1	19.3	232 12.1	11.7	212 16.5	109	22 00.4	+ 5
18	126 40.7	44 33.6	+27 14.2	175 06.8	−19 31.4	342 15.5	+15 19.2	247 14.8	−18 11.6	226 46.4	109	−21 59.9	+ 6
19	141 43.2	59 33.8	14.4	190 07.7	31.0	357 17.9	19.2	262 17.4	11.6	241 16.3	109	21 59.3	+ 8
20	156 45.6	74 33.9	14.5	205 08.5	30.7	12 20.3	19.2	277 20.0	11.5	255 46.2	109	21 58.5	+ 8
21	171 48.1	89 34.1	14.7	220 09.4	30.3	27 22.6	19.1	292 22.7	11.5	270 16.1	110	·21 57.7	+ 10
22	186 50.6	104 34.3	14.8	235 10.2	30.0	42 25.0	19.1	307 25.3	11.5	284 46.1	110	21 56.7	+ 10
23	201 53.0	119 34.5	15.0	250 11.0	29.7	57 27.4	19.1	322 27.9	11.4	299 16.1	110	21 55.7	+ 12
29 0	216 55.5	134 34.7	+27 15.1	265 11.9	−19 29.3	72 29.8	+15 19.0	337 30.6	−18 11.4	313 46.1	110	−21 54.5	+ 13
1	231 58.0	149 34.8	15.3	280 12.7	29.0	87 32.2	19.0	352 33.2	11.4	328 16.1	111	21 53.2	+ 14
2	247 00.4	164 35.0	15.4	295 13.5	28.6	102 34.5	19.0	7 35.8	11.3	342 46.2	111	21 51.8	+ 15
3	262 02.9	179 35.2	15.6	310 14.4	28.3	117 36.9	18.9	22 38.5	11.3	357 16.3	111	·21 50.3	+ 15
4	277 05.3	194 35.4	15.7	325 15.2	27.9	132 39.3	18.9	37 41.1	11.3	11 46.4	112	21 48.8	+ 17
5	292 07.8	209 35.6	15.9	340 16.1	27.6	147 41.7	18.9	52 43.7	11.2	26 16.6	112	21 47.1	+ 18
6	307 10.3	224 35.8	+27 16.0	355 16.9	−19 27.3	162 44.1	+15 18.8	67 46.4	−18 11.2	40 46.8	112	−21 45.3	+ 19
7	322 12.7	239 36.0	16.2	10 17.8	26.9	177 46.4	18.8	82 49.0	11.2	55 17.0	113	21 43.4	+ 20
8	337 15.2	254 36.2	16.3	25 18.6	26.6	192 48.8	18.8	97 51.6	11.1	69 47.3	112	21 41.4	+ 22
9	352 17.7	269 36.4	16.5	40 19.4	26.2	207 51.2	18.7	112 54.3	11.1	84 17.5	114	·21 39.2	+ 22
10	7 20.1	284 36.6	16.6	55 20.3	25.9	222 53.6	18.7	127 56.9	11.1	98 47.9	113	21 37.0	+ 23
11	22 22.6	299 36.8	16.8	70 21.1	25.5	237 55.9	18.7	142 59.5	11.0	113 18.2	114	21 34.7	+ 24
12	37 25.1	314 37.0	+27 16.9	85 22.0	−19 25.2	252 58.3	+15 18.6	158 02.2	−18 11.0	127 48.6	114	−21 32.3	+ 25
13	52 27.5	329 37.2	17.1	100 22.8	24.8	268 00.7	18.6	173 04.8	10.9	142 19.0	114	21 29.8	+ 26
14	67 30.0	344 37.4	17.2	115 23.6	24.5	283 03.1	18.6	188 07.4	10.9	156 49.4	115	21 27.2	+ 27
15	82 32.4	359 37.6	17.3	130 24.5	24.2	298 05.4	18.5	203 10.1	10.9	171 19.9	115	·21 24.5	+ 28
16	97 34.9	14 37.8	17.5	145 25.3	23.8	313 07.8	18.5	218 12.7	10.8	185 50.4	116	21 21.7	+ 30
17	112 37.4	29 38.0	17.6	160 26.2	23.5	328 10.2	18.5	233 15.3	10.8	200 21.0	116	21 18.7	+ 30
18	127 39.8	44 38.2	+27 17.7	175 27.0	−19 23.1	343 12.6	+15 18.4	248 18.0	−18 10.8	214 51.6	116	−21 15.7	+ 31
19	142 42.3	59 38.4	17.9	190 27.9	22.8	358 14.9	18.4	263 20.6	10.7	229 22.2	117	21 12.6	+ 32
20	157 44.8	74 38.6	18.0	205 28.7	22.4	13 17.3	18.4	278 23.2	10.7	243 52.9	116	21 09.4	+ 33
21	172 47.2	89 38.8	18.2	220 29.6	22.1	28 19.7	18.3	293 25.9	10.7	258 23.5	118	·21 06.1	+ 34
22	187 49.7	104 39.0	18.3	235 30.4	21.7	43 22.1	18.3	308 28.5	10.6	272 54.3	117	21 02.7	+ 35
23	202 52.2	119 39.2	18.4	250 31.2	21.4	58 24.4	18.2	323 31.2	10.6	287 25.0	118	20 59.2	+ 36
24	217 54.6	134 39.5	+27 18.6	265 32.1	−19 21.0	73 26.8	+15 18.2	338 33.8	−18 10.6	301 55.8	119	−20 55.6	+ 37
code	−	+ 1	+ 2	+ 8	+ 3	+ 24	0	+ 26	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
27 0	180 34.9	+13 45.4	7	Acamar	315 51.2	−40 28.8
1	195 35.0	46.2	5	Achernar	335 59.1	−57 27.4
2	210 35.1	47.0	30	Acrux	173 56.7	−62 51.8
3	225 35.2	·· 47.8	19	Adhara	255 46.4	−28 55.0
4	240 35.3	48.6	10	Aldebaran	291 38.9	+16 25.3
5	255 35.4	49.4				
6	270 35.5	+13 50.2	32	Alioth	166 57.7	+56 11.8
7	285 35.6	51.0	34	Alkaid	153 32.1	+49 31.8
8	300 35.7	51.8	55	Al Na'ir	28 37.6	−47 10.1
9	315 35.8	·· 52.6	15	Alnilam	276 30.1	− 1 13.8
10	330 35.9	53.4	25	Alphard	218 38.1	− 8 28.4
11	345 36.0	54.2				
12	0 36.1	+13 55.0	41	Alphecca	126 46.9	+26 51.5
13	15 36.2	55.8	1	Alpheratz	358 28.2	+28 50.9
14	30 36.3	56.5	51	Altair	62 49.9	+ 8 45.0
15	45 36.4	·· 57.3	2	Ankaa	353 58.2	−42 32.4
16	60 36.5	58.1	42	Antares	113 18.5	−26 20.2
17	75 36.6	58.9				
18	90 36.7	+13 59.7	37	Arcturus	146 34.4	+19 24.4
19	105 36.8	14 00.5	43	Atria	108 58.4	−68 56.9
20	120 36.9	01.3	22	Avior	234 35.6	−59 22.5
21	135 37.0	·· 02.1	13	Bellatrix	279 18.2	+ 6 18.6
22	150 37.1	02.9	16	Betelg'se	271 47.9	+ 7 23.9
23	165 37.2	03.7				
			17	Canopus	264 15.5	−52 40.6
28 0	180 37.3	+14 04.5	12	Capella	281 38.1	+45 57.4
1	195 37.4	05.2	53	Deneb	50 00.7	+45 07.2
2	210 37.5	06.0	28	Denebola	183 17.1	+14 48.8
3	225 37.6	·· 06.8	4	Diphda	349 39.1	−18 13.5
4	240 37.7	07.6				
5	255 37.8	08.4	27	Dubhe	194 43.7	+61 59.3
6	270 37.9	+14 09.2	14	Elnath	279 07.1	+28 34.3
7	285 38.0	10.0	47	Eltanin	91 05.7	+51 29.4
8	300 38.1	10.8	54	Enif	34 29.2	+ 9 40.4
9	315 38.2	·· 11.5	56	Fomalhaut	16 11.3	−29 51.1
10	330 38.2	12.3				
11	345 38.3	13.1	31	Gacrux	172 48.2	−56 52.4
12	0 38.4	+14 13.9	29	Gienah	176 36.1	−17 18.2
13	15 38.5	14.7	35	Hadar	149 48.1	−60 10.0
14	30 38.6	15.5	6	Hamal	328 49.5	+23 15.4
15	45 38.7	·· 16.2	48	Kaus Aust.	84 40.4	−34 24.3
16	60 38.8	17.0				
17	75 38.9	17.8	40	Kochab	137 16.8	+74 20.0
18	90 39.0	+14 18.6	57	Markab	14 21.2	+14 58.1
19	105 39.1	19.4	8	Menkar	315 00.2	+ 3 55.1
20	120 39.2	20.1	36	Menkent	148 57.8	−36 09.5
21	135 39.3	·· 20.9	24	Miapl'dus	221 48.8	−69 32.7
22	150 39.4	21.7				
23	165 39.4	22.5	9	Mirfak	309 42.2	+49 42.4
			50	Nunki	76 51.2	−26 21.1
29 0	180 39.5	+14 23.3	52	Peacock	54 26.6	−56 52.3
1	195 39.6	24.0	21	Pollux	244 20.2	+28 08.0
2	210 39.7	24.8	20	Procyon	245 44.6	+ 5 20.1
3	225 39.8	·· 25.6				
4	240 39.9	26.4	46	R'alhague	96 46.0	+12 35.3
5	255 40.0	27.2	26	Regulus	208 28.9	+12 10.7
6	270 40.1	+14 27.9	11	Rigel	281 53.5	− 8 15.2
7	285 40.2	28.7	38	Rigil Kent.	140 49.7	−60 39.5
8	300 40.2	29.5	44	Sabik	103 01.4	−15 40.4
9	315 40.3	·· 30.3				
10	330 40.4	31.0	3	Schedar	350 30.0	+56 17.8
11	345 40.5	31.8	45	Shaula	97 19.8	−37 04.4
12	0 40.6	+14 32.6	18	Sirius	259 11.6	−16 39.5
13	15 40.7	33.4	33	Spica	159 16.1	−10 56.2
14	30 40.8	34.1	23	Suhail	223 23.9	−43 15.7
15	45 40.9	·· 34.9				
16	60 40.9	35.7	49	Vega	81 07.7	+38 44.3
17	75 41.0	36.4	39	Zub'g'bi	137 52.5	−15 51.8
18	90 41.1	+14 37.2				
19	105 41.2	38.0				
20	120 41.3	38.8				
21	135 41.4	·· 39.5				
22	150 41.5	40.3				
23	165 41.5	41.1				
24	180 41.6	+14 41.8				
code	—	+ 8				

GMT	Equation of Time (App. − Mean) 27	28	29
h	m s	m s	m s
0	+ 2 19.6	+ 2 29.0	+ 2 37.9
6	+ 2 22.0	+ 2 31.3	+ 2 40.1
12	+ 2 24.4	+ 2 33.5	+ 2 42.2
18	+ 2 26.7	+ 2 35.8	+ 2 44.3
24	+ 2 29.0	+ 2 37.9	+ 2 46.3

Lat.	Sunrise	Twlt. begins	Moonrise 27	28	29	30
N °	h m	h m	h m	h m	h m	h m
72	2 16	////	▬	▬	▬	▬
70	2 48	////	▬	▬	▬	▬
68	3 11	////	0 13	▬	2 52	2 40
66	3 29	////	24 38	0 38	1 28	1 52
64	3 44	////	24 00	0 00	0 50	1 22
62	3 56	////	23 33	24 24	0 24	0 59
60	4 06	////	23 12	24 03	0 03	0 40
58	4 15	////	22 55	23 46	24 25	0 25
56	4 23	1 17	22 41	23 31	24 12	0 12
54	4 30	1 49	22 28	23 19	24 00	0 00
52	4 36	2 11	22 17	23 08	23 50	24 24
50	4 42	2 29	22 07	22 58	23 41	24 16
45	4 54	3 01	21 47	22 38	23 22	24 00
40	5 04	3 23	21 31	22 21	23 06	23 46
35	5 12	3 41	21 17	22 07	22 53	23 34
30	5 20	3 55	21 05	21 55	22 41	23 24
20	5 33	4 16	20 44	21 34	22 22	23 06
10	5 44	4 31	20 26	21 16	22 04	22 51
0	5 54	4 43	20 09	20 59	21 48	22 36
10	6 04	4 53	19 52	20 42	21 32	22 22
20	6 15	5 00	19 35	20 24	21 15	22 06
30	6 27	5 05	19 14	20 04	20 55	21 48
35	6 34	5 08	19 02	19 52	20 44	21 38
40	6 42	5 10	18 48	19 38	20 30	21 26
45	6 51	5 11	18 32	19 21	20 15	21 12
50	7 02	5 12	18 12	19 01	19 55	20 54
52	7 07	5 12	18 03	18 51	19 46	20 46
54	7 13	5 11	17 52	18 40	19 36	20 37
56	7 19	5 11	17 40	18 28	19 24	20 27
58	7 26	5 10	17 26	18 13	19 10	20 15
60	7 34	5 10	17 10	17 56	18 55	20 01
S						

Lat.	Sunset	Twlt. ends	Moonset 27	28	29	30
N °	h m	h m	h m	h m	h m	h m
72	21 45	////	▬	▬	▬	▬
70	21 11	////	▬	▬	▬	▬
68	20 47	////	2 43	▬	3 32	5 27
66	20 28	////	3 34	4 03	4 57	6 14
64	20 13	////	4 06	4 41	5 35	6 44
62	20 01	////	4 30	5 08	6 01	7 07
60	19 50	////	4 49	5 29	6 22	7 25
58	19 41	////	5 04	5 46	6 39	7 40
56	19 33	22 45	5 18	6 01	6 53	7 53
54	19 26	22 12	5 29	6 13	7 05	8 04
52	19 20	21 49	5 40	6 24	7 16	8 14
50	19 14	21 31	5 49	6 34	7 26	8 23
45	19 02	20 58	6 08	6 55	7 46	8 42
40	18 52	20 34	6 24	7 11	8 02	8 57
35	18 43	20 16	6 38	7 25	8 16	9 09
30	18 35	20 01	6 49	7 38	8 28	9 21
20	18 22	19 39	7 09	7 58	8 49	9 40
10	18 11	19 24	7 27	8 17	9 07	9 56
0	18 01	19 12	7 43	8 34	9 23	10 12
10	17 51	19 03	7 59	8 50	9 40	10 27
20	17 40	18 55	8 17	9 08	9 58	10 43
30	17 27	18 48	8 37	9 29	10 18	11 02
35	17 20	18 46	8 48	9 41	10 30	11 13
40	17 12	18 44	9 02	9 55	10 43	11 26
45	17 03	18 42	9 18	10 12	10 59	11 40
50	16 52	18 41	9 38	10 32	11 19	11 58
52	16 47	18 41	9 47	10 42	11 29	12 07
54	16 41	18 41	9 57	10 53	11 39	12 16
56	16 35	18 42	10 09	11 06	11 51	12 26
58	16 28	18 42	10 23	11 20	12 05	12 39
60	16 20	18 42	10 39	11 37	12 21	12 53
S						

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
27	1 31	15 02	6 22	19 15	1 38
28	2 21	15 02	6 20	19 11	1 34
29	3 11	15 02	6 19	19 07	1 30
30	4 00	15 01	6 18	19 03	1 26

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.2	0.2	0.1
30	0.2	0.2	0.1
45	0.2	0.2	0.1
60	0.2	0.1	0.1
75	0.2	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	27	28	29
°	′	′	′
0	13.3	12.8	12.2
4	13.3	12.8	12.3
8	13.3	12.8	12.3
12	13.3	12.8	12.3
16	13.3	12.9	12.4
20	13.4	12.9	12.4
24	13.4	13.0	12.5
28	13.5	13.0	12.6
32	13.6	13.1	12.7
36	13.6	13.2	12.8
40	13.7	13.3	12.9
44	13.8	13.4	13.0
48	13.9	13.5	13.2
52	14.0	13.7	13.3
56	14.1	13.8	13.5
60	14.2	13.9	13.6
64	14.3	14.1	13.8
68	14.4	14.2	14.0
72	14.6	14.3	14.1
76	14.7	14.5	14.3
80	14.8	14.6	14.5
84	14.9	14.8	14.7
88	15.0	14.9	14.8
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	27	28	29
°	′	′	′
0	16.9	17.2	17.4
4	16.8	17.1	17.4
8	16.8	17.1	17.4
12	16.8	17.1	17.4
16	16.8	17.0	17.3
20	16.7	17.0	17.3
24	16.7	16.9	17.2
28	16.6	16.9	17.1
32	16.6	16.8	17.0
36	16.5	16.7	16.9
40	16.4	16.6	16.8
44	16.3	16.5	16.6
48	16.2	16.4	16.5
52	16.1	16.2	16.4
56	16.0	16.1	16.2
60	15.9	16.0	16.1
64	15.8	15.8	15.9
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.3	15.3	15.2
84	15.2	15.1	15.0
88	15.1	15.0	14.9
90			

Subtract from table, back cover

292626 O - 55 - 6

GMT	♈ GHA	VENUS −4.1 GHA	VENUS −4.1 Dec.	MARS 0.3 GHA	MARS 0.3 Dec.	JUPITER −1.7 GHA	JUPITER −1.7 Dec.	SATURN 0.3 GHA	SATURN 0.3 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
30 0	217 54.6	134 39.5	+27 18.6	265 32.1	−19 21.0	73 26.8	+15 18.2	338 33.8	−18 10.6	301 55.8	119	−20 55.6	+ 37
1	232 57.1	149 39.7	18.7	280 32.9	20.7	88 29.2	18.2	353 36.4	10.5	316 26.7	119	20 51.9	+ 38
2	247 59.6	164 39.9	18.8	295 33.8	20.4	103 31.6	18.1	8 39.1	10.5	330 57.6	119	20 48.1	+ 39
3	263 02.0	179 40.1	18.9	310 34.6	20.0	118 33.9	18.1	23 41.7	10.5	345 28.5	119	20 44.2	+ 40
4	278 04.5	194 40.3	19.1	325 35.5	19.7	133 36.3	18.1	38 44.3	10.4	359 59.4	120	20 40.2	+ 40
5	293 06.9	209 40.6	19.2	340 36.3	19.3	148 38.7	18.0	53 47.0	10.4	14 30.4	120	20 36.2	+ 42
6	308 09.4	224 40.8	+27 19.3	355 37.2	−19 19.0	163 41.1	+15 18.0	68 49.6	−18 10.3	29 01.4	121	−20 32.0	+ 43
7	323 11.9	239 41.0	19.5	10 38.0	18.6	178 43.4	18.0	83 52.2	10.3	43 32.5	121	20 27.7	+ 43
8	338 14.3	254 41.2	19.6	25 38.9	18.3	193 45.8	17.9	98 54.9	10.3	58 03.6	122	20 23.4	+ 45
9	353 16.8	269 41.5	19.7	40 39.7	17.9	208 48.2	17.9	113 57.5	10.2	72 34.8	121	20 18.9	+ 45
10	8 19.3	284 41.7	19.8	55 40.6	17.6	223 50.5	17.8	129 00.1	10.2	87 05.9	123	20 14.4	+ 46
11	23 21.7	299 41.9	20.0	70 41.4	17.2	238 52.9	17.8	144 02.8	10.2	101 37.2	122	20 09.8	+ 47
12	38 24.2	314 42.2	+27 20.1	85 42.2	−19 16.9	253 55.3	+15 17.8	159 05.4	−18 10.1	116 08.4	123	−20 05.1	+ 48
13	53 26.7	329 42.4	20.2	100 43.1	16.5	268 57.6	17.7	174 08.0	10.1	130 39.7	124	20 00.3	+ 49
14	68 29.1	344 42.6	20.3	115 43.9	16.2	284 00.0	17.7	189 10.7	10.1	145 11.1	124	19 55.4	+ 50
15	83 31.6	359 42.9	20.4	130 44.8	15.8	299 02.4	17.7	204 13.3	10.0	159 42.5	124	19 50.4	+ 51
16	98 34.1	14 43.1	20.6	145 45.6	15.5	314 04.8	17.6	219 16.0	10.0	174 13.9	124	19 45.3	+ 52
17	113 36.5	29 43.4	20.7	160 46.5	15.1	329 07.1	17.6	234 18.6	10.0	188 45.3	125	19 40.1	+ 52
18	128 39.0	44 43.6	+27 20.8	175 47.3	−19 14.8	344 09.5	+15 17.5	249 21.2	−18 09.9	203 16.8	126	−19 34.9	+ 54
19	143 41.4	59 43.8	20.9	190 48.2	14.4	359 11.9	17.5	264 23.9	09.9	217 48.4	125	19 29.5	+ 54
20	158 43.9	74 44.1	21.0	205 49.0	14.1	14 14.2	17.5	279 26.5	09.8	232 19.9	127	19 24.1	+ 55
21	173 46.4	89 44.3	21.1	220 49.9	13.7	29 16.6	17.4	294 29.1	09.8	246 51.6	126	19 18.6	+ 56
22	188 48.8	104 44.6	21.2	235 50.7	13.4	44 19.0	17.4	309 31.8	09.8	261 23.2	127	19 13.0	+ 57
23	203 51.3	119 44.8	21.4	250 51.6	13.0	59 21.3	17.4	324 34.4	09.7	275 54.9	127	19 07.3	+ 58
1 0	218 53.8	134 45.1	+27 21.5	265 52.4	−19 12.7	74 23.7	+15 17.3	339 37.1	−18 09.7	290 26.6	128	−19 01.5	+ 58
1	233 56.2	149 45.3	21.6	280 53.3	12.3	89 26.1	17.3	354 39.7	09.7	304 58.4	128	18 55.7	+ 59
2	248 58.7	164 45.6	21.7	295 54.1	12.0	104 28.4	17.2	9 42.3	09.6	319 30.2	129	18 49.8	+ 61
3	264 01.2	179 45.9	21.8	310 55.0	11.6	119 30.8	17.2	24 45.0	09.6	334 02.1	129	18 43.7	+ 61
4	279 03.6	194 46.1	21.9	325 55.8	11.3	134 33.2	17.2	39 47.6	09.6	348 34.0	129	18 37.6	+ 61
5	294 06.1	209 46.4	22.0	340 56.7	10.9	149 35.5	17.1	54 50.2	09.5	3 05.9	130	18 31.5	+ 63
6	309 08.5	224 46.6	+27 22.1	355 57.5	−19 10.6	164 37.9	+15 17.1	69 52.9	−18 09.5	17 37.9	130	−18 25.2	+ 63
7	324 11.0	239 46.9	22.2	10 58.4	10.2	179 40.2	17.1	84 55.5	09.5	32 09.9	130	18 18.9	+ 65
8	339 13.5	254 47.2	22.3	25 59.3	09.9	194 42.6	17.0	99 58.1	09.4	46 41.9	131	18 12.4	+ 65
9	354 15.9	269 47.4	22.4	41 00.1	09.5	209 45.0	17.0	115 00.8	09.4	61 14.0	131	18 05.9	+ 66
10	9 18.4	284 47.7	22.5	56 01.0	09.2	224 47.3	16.9	130 03.4	09.3	75 46.1	132	17 59.3	+ 66
11	24 20.9	299 48.0	22.6	71 01.8	08.8	239 49.7	16.9	145 06.1	09.3	90 18.3	132	17 52.7	+ 68
12	39 23.3	314 48.2	+27 22.7	86 02.7	−19 08.5	254 52.1	+15 16.9	160 08.7	−18 09.3	104 50.5	132	−17 45.9	+ 68
13	54 25.8	329 48.5	22.8	101 03.5	08.1	269 54.4	16.8	175 11.3	09.2	119 22.7	133	17 39.1	+ 69
14	69 28.3	344 48.8	22.9	116 04.4	07.8	284 56.8	16.8	190 14.0	09.2	133 55.0	133	17 32.2	+ 69
15	84 30.7	359 49.1	23.0	131 05.2	07.4	299 59.1	16.7	205 16.6	09.2	148 27.3	133	17 25.3	+ 71
16	99 33.2	14 49.3	23.1	146 06.1	07.1	315 01.5	16.7	220 19.3	09.1	162 59.6	134	17 18.2	+ 71
17	114 35.7	29 49.6	23.2	161 06.9	06.7	330 03.9	16.7	235 21.9	09.1	177 32.0	134	17 11.1	+ 72
18	129 38.1	44 49.9	+27 23.3	176 07.8	−19 06.4	345 06.2	+15 16.6	250 24.5	−18 09.1	192 04.4	135	−17 03.9	+ 73
19	144 40.6	59 50.2	23.4	191 08.6	06.0	0 08.6	16.6	265 27.2	09.0	206 36.9	135	16 56.6	+ 73
20	159 43.0	74 50.5	23.5	206 09.5	05.7	15 10.9	16.5	280 29.8	09.0	221 09.4	135	16 49.3	+ 74
21	174 45.5	89 50.8	23.6	221 10.4	05.3	30 13.3	16.5	295 32.4	09.0	235 41.9	136	16 41.9	+ 75
22	189 48.0	104 51.0	23.7	236 11.2	05.0	45 15.7	16.5	310 35.1	08.9	250 14.5	136	16 34.4	+ 76
23	204 50.4	119 51.3	23.8	251 12.1	04.6	60 18.0	16.4	325 37.7	08.9	264 47.1	136	16 26.8	+ 76
2 0	219 52.9	134 51.6	+27 23.9	266 12.9	−19 04.3	75 20.4	+15 16.4	340 40.4	−18 08.8	279 19.7	137	−16 19.2	+ 77
1	234 55.4	149 51.9	24.0	281 13.8	03.9	90 22.7	16.3	355 43.0	08.8	293 52.4	137	16 11.5	+ 78
2	249 57.8	164 52.2	24.1	296 14.6	03.5	105 25.1	16.3	10 45.6	08.8	308 25.1	137	16 03.7	+ 79
3	265 00.3	179 52.5	24.1	311 15.5	03.2	120 27.5	16.3	25 48.3	08.7	322 57.8	137	−15 55.8	+ 79
4	280 02.8	194 52.8	24.2	326 16.3	02.8	135 29.8	16.2	40 50.9	08.7	337 30.5	138	15 47.9	+ 80
5	295 05.2	209 53.1	24.3	341 17.2	02.5	150 32.2	16.2	55 53.6	08.7	352 03.3	139	15 39.9	+ 80
6	310 07.7	224 53.4	+27 24.4	356 18.1	−19 02.1	165 34.5	+15 16.1	70 56.2	−18 08.6	6 36.2	138	−15 31.9	+ 81
7	325 10.2	239 53.7	24.5	11 18.9	01.8	180 36.9	16.1	85 58.8	08.6	21 09.0	139	15 23.8	+ 82
8	340 12.6	254 54.0	24.6	26 19.8	01.4	195 39.2	16.1	101 01.5	08.6	35 41.9	139	15 15.6	+ 83
9	355 15.1	269 54.3	24.7	41 20.6	01.1	210 41.6	16.0	116 04.1	08.5	50 14.8	140	−15 07.3	+ 83
10	10 17.5	284 54.6	24.7	56 21.5	00.7	225 44.0	16.0	131 06.8	08.5	64 47.8	140	14 59.0	+ 84
11	25 20.0	299 54.9	24.8	71 22.3	00.4	240 46.3	15.9	146 09.4	08.4	79 20.8	140	14 50.6	+ 84
12	40 22.5	314 55.2	+27 24.9	86 23.2	−19 00.0	255 48.7	+15 15.9	161 12.0	−18 08.4	93 53.8	140	−14 42.2	+ 86
13	55 24.9	329 55.6	25.0	101 24.1	18 59.6	270 51.0	15.8	176 14.7	08.4	108 26.8	141	14 33.6	+ 85
14	70 27.4	344 55.9	25.1	116 24.9	59.3	285 53.4	15.8	191 17.3	08.3	122 59.9	141	14 25.1	+ 87
15	85 29.9	359 56.2	25.1	131 25.8	58.9	300 55.7	15.8	206 20.0	08.3	137 33.0	141	−14 16.4	+ 87
16	100 32.3	14 56.5	25.2	146 26.6	58.6	315 58.1	15.7	221 22.6	08.3	152 06.1	142	14 07.7	+ 88
17	115 34.8	29 56.8	25.3	161 27.5	58.2	331 00.4	15.7	236 25.2	08.2	166 39.3	141	13 58.9	+ 88
18	130 37.3	44 57.1	+27 25.4	176 28.4	−18 57.9	346 02.8	+15 15.6	251 27.9	−18 08.2	181 12.4	142	−13 50.1	+ 89
19	145 39.7	59 57.5	25.4	191 29.2	57.5	1 05.1	15.6	266 30.5	08.2	195 45.6	143	13 41.2	+ 89
20	160 42.2	74 57.8	25.5	206 30.1	57.2	16 07.5	15.5	281 33.2	08.1	210 18.9	142	13 32.3	+ 91
21	175 44.7	89 58.1	25.6	221 30.9	56.8	31 09.9	15.5	296 35.8	08.1	224 52.1	143	−13 23.2	+ 90
22	190 47.1	104 58.4	25.7	236 31.8	56.4	46 12.2	15.5	311 38.4	08.0	239 25.4	143	13 14.2	+ 92
23	205 49.6	119 58.8	25.7	251 32.7	56.1	61 14.6	15.4	326 41.1	08.0	253 58.7	143	13 05.0	+ 92
24	220 52.0	134 59.1	+27 25.8	266 33.5	−18 55.7	76 16.9	+15 15.4	341 43.7	−18 08.0	268 32.0	143	−12 55.8	+ 92
code	−	+ 3	+ 1	+ 8	+ 4	+ 23	− 1	+ 26	+ 1				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
30 0	180 41.6	+14 41.8	7	Acamar	315 51.2	−40 28.8
1	195 41.7	42.6	5	Achernar	335 59.1	−57 27.4
2	210 41.8	43.4	30	Acrux	173 56.7	−62 51.8
3	225 41.9	·· 44.1	19	Adhara	255 46.4	−28 55.0
4	240 42.0	44.9	10	Aldebaran	291 38.9	+16 25.3
5	255 42.0	45.7				
6	270 42.1	+14 46.4	32	Alioth	166 57.7	+56 11.8
7	285 42.2	47.2	34	Alkaid	153 32.1	+49 31.8
8	300 42.3	48.0	55	Al Na'ir	28 37.6	−47 10.1
9	315 42.4	·· 48.7	15	Alnilam	276 30.1	− 1 13.8
10	330 42.5	49.5	25	Alphard	218 38.1	− 8 28.4
11	345 42.5	50.3				
12	0 42.6	+14 51.0	41	Alphecca	126 46.9	+26 51.5
13	15 42.7	51.8	1	Alpheratz	358 28.1	+28 50.9
14	30 42.8	52.6	51	Altair	62 49.9	+ 8 45.1
15	45 42.9	·· 53.3	2	Ankaa	353 58.2	−42 32.4
16	60 42.9	54.1	42	Antares	113 18.5	−26 20.2
17	75 43.0	54.8				
18	90 43.1	+14 55.6	37	Arcturus	146 34.4	+19 24.4
19	105 43.2	56.4	43	Atria	108 58.3	−68 56.9
20	120 43.3	57.1	22	Avior	234 35.7	−59 22.5
21	135 43.3	·· 57.9	13	Bellatrix	279 18.2	+ 6 18.6
22	150 43.4	58.7	16	Betelg'se	271 47.9	+ 7 23.9
23	165 43.5	14 59.4				
			17	Canopus	264 15.5	−52 40.6
1 0	180 43.6	+15 00.2	12	Capella	281 38.2	+45 57.4
1	195 43.7	00.9	53	Deneb	50 00.6	+45 07.2
2	210 43.7	01.7	28	Denebola	183 17.1	+14 48.8
3	225 43.8	·· 02.4	4	Diphda	349 39.1	−18 13.5
4	240 43.9	03.2				
5	255 44.0	04.0	27	Dubhe	194 43.7	+61 59.3
6	270 44.0	+15 04.7	14	Elnath	279 07.1	+28 34.3
7	285 44.1	05.5	47	Eltanin	91 05.7	+51 29.4
8	300 44.2	06.2	54	Enif	34 29.2	+ 9 40.4
9	315 44.3	·· 07.0	56	Fomalhaut	16 11.3	−29 51.1
10	330 44.4	07.7				
11	345 44.4	08.5	31	Gacrux	172 48.2	−56 52.4
12	0 44.5	+15 09.2	29	Gienah	176 36.1	−17 18.2
13	15 44.6	10.0	35	Hadar	149 48.1	−60 10.0
14	30 44.7	10.8	6	Hamal	328 49.5	+23 15.4
15	45 44.7	·· 11.5	48	Kaus Aust.	84 40.3	−34 24.3
16	60 44.8	12.3				
17	75 44.9	13.0	40	Kochab	137 16.8	+74 20.0
18	90 45.0	+15 13.8	57	Markab	14 21.2	+14 58.1
19	105 45.0	14.5	8	Menkar	315 00.2	+ 3 55.1
20	120 45.1	15.3	36	Menkent	148 57.7	−36 09.5
21	135 45.2	·· 16.0	24	Miapl'dus	221 48.8	−69 32.7
22	150 45.3	16.8				
23	165 45.3	17.5	9	Mirfak	309 42.2	+49 42.4
			50	Nunki	76 51.2	−26 21.1
2 0	180 45.4	+15 18.3	52	Peacock	54 26.5	−56 52.3
2 1	195 45.5	19.0	21	Pollux	244 20.2	+28 08.0
2	210 45.5	19.8	20	Procyon	245 44.6	+ 5 20.1
3	225 45.6	·· 20.5				
4	240 45.7	21.2	46	R'alhague	96 45.9	+12 35.3
5	255 45.8	22.0	26	Regulus	208 29.0	+12 10.7
6	270 45.8	+15 22.7	11	Rigel	281 53.5	− 8 15.2
7	285 45.9	23.5	38	Rigil Kent.	140 49.7	−60 39.5
8	300 46.0	24.2	44	Sabik	103 01.4	−15 40.4
9	315 46.0	·· 25.0				
10	330 46.1	25.7	3	Schedar	350 29.9	+56 17.8
11	345 46.2	26.5	45	Shaula	97 19.8	−37 04.4
12	0 46.3	+15 27.2	18	Sirius	259 11.7	−16 39.5
13	15 46.3	27.9	33	Spica	159 16.1	−10 56.2
14	30 46.4	28.7	23	Suhail	223 24.0	−43 15.7
15	45 46.5	·· 29.4				
16	60 46.5	30.2	49	Vega	81 07.7	+38 44.3
17	75 46.6	30.9	39	Zub'g'bi	137 52.5	−15 51.8
18	90 46.7	+15 31.7				
19	105 46.7	32.4				
20	120 46.8	33.1				
21	135 46.9	·· 33.9				
22	150 47.0	34.6				
23	165 47.0	35.4				
24	180 47.1	+15 36.1				
code	—	+ 8				

GMT	Equation of Time (App. − Mean) 30	1	2
h	m s	m s	m s
0	+ 2 46.3	+ 2 54.2	+ 3 01.5
6	+ 2 48.3	+ 2 56.0	+ 3 03.2
12	+ 2 50.3	+ 2 57.9	+ 3 04.9
18	+ 2 52.3	+ 2 59.7	+ 3 06.6
24	+ 2 54.2	+ 3 01.5	+ 3 08.2

Lat.	Sunrise	Twlt. begins	Moonrise 30	1	2	3
N °	h m	h m	h m	h m	h m	h m
72	1 52	////	▬	▬	3 35	3 04
70	2 31	////	▬	3 21	2 57	2 42
68	2 57	////	2 40	2 34	2 29	2 25
66	3 17	////	1 52	2 03	2 09	2 11
64	3 33	////	1 22	1 40	1 52	2 00
62	3 47	////	0 59	1 22	1 38	1 50
60	3 58	////	0 40	1 07	1 27	1 41
58	4 08	////	0 25	0 54	1 16	1 34
56	4 16	0 54	0 12	0 43	1 07	1 27
54	4 24	1 35	0 00	0 33	1 00	1 21
52	4 30	2 00	24 24	0 24	0 52	1 16
50	4 36	2 19	24 16	0 16	0 46	1 11
45	4 49	2 54	24 00	0 00	0 32	1 01
40	5 00	3 18	23 46	24 21	0 21	0 52
35	5 09	3 36	23 34	24 11	0 11	0 44
30	5 17	3 51	23 24	24 02	0 02	0 38
20	5 31	4 13	23 06	23 47	24 26	0 26
10	5 43	4 30	22 51	23 34	24 16	0 16
0	5 54	4 43	22 36	23 22	24 06	0 06
10	6 04	4 52	22 22	23 10	23 57	24 44
20	6 16	5 01	22 06	22 57	23 47	24 37
30	6 29	5 07	21 48	22 41	23 35	24 29
35	6 36	5 09	21 38	22 33	23 28	24 24
40	6 45	5 12	21 26	22 23	23 20	24 19
45	6 55	5 13	21 12	22 11	23 11	24 13
50	7 07	5 15	20 54	21 56	23 00	24 06
52	7 12	5 15	20 46	21 50	22 55	24 02
54	7 18	5 15	20 37	21 42	22 50	23 58
56	7 25	5 16	20 27	21 34	22 43	23 54
58	7 32	5 16	20 15	21 25	22 36	23 50
60	7 41	5 15	20 01	21 14	22 28	23 45
S						

Lat.	Sunset	Twlt. ends	Moonset 30	1	2	3
N °	h m	h m	h m	h m	h m	h m
72	22 09	////	▬	▬	7 45	9 49
70	21 28	////	▬	6 24	8 23	10 09
68	21 00	////	5 27	7 10	8 49	10 25
66	20 39	////	6 14	7 40	9 09	10 38
64	20 23	////	6 44	8 02	9 25	10 48
62	20 09	////	7 07	8 20	9 38	10 57
60	19 58	////	7 25	8 35	9 49	11 05
58	19 48	////	7 40	8 48	9 59	11 11
56	19 39	23 09	7 53	8 58	10 07	11 17
54	19 32	22 26	8 04	9 08	10 14	11 22
52	19 25	21 59	8 14	9 16	10 21	11 27
50	19 19	21 39	8 23	9 24	10 27	11 32
45	19 05	21 03	8 42	9 40	10 40	11 41
40	18 55	20 39	8 57	9 53	10 50	11 48
35	18 45	20 19	9 09	10 04	10 59	11 55
30	18 37	20 04	9 21	10 14	11 07	12 01
20	18 24	19 42	9 40	10 30	11 21	12 11
10	18 12	19 25	9 56	10 45	11 33	12 19
0	18 00	19 11	10 12	10 58	11 44	12 28
10	17 50	19 02	10 27	11 12	11 55	12 36
20	17 38	18 53	10 43	11 26	12 06	12 44
30	17 25	18 46	11 02	11 42	12 19	12 54
35	17 17	18 43	11 13	11 52	12 27	12 59
40	17 09	18 41	11 26	12 03	12 36	13 06
45	16 59	18 39	11 40	12 15	12 46	13 13
50	16 47	18 37	11 58	12 30	12 58	13 21
52	16 42	18 37	12 07	12 38	13 03	13 25
54	16 35	18 36	12 16	12 45	13 09	13 30
56	16 29	18 36	12 26	12 54	13 16	13 35
58	16 21	18 36	12 39	13 04	13 24	13 40
60	16 12	18 35	12 53	13 16	13 33	13 46
S						

DAY	GMT of Transit Meridian of Greenwich Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
30	4 00	15 01	6 18	19 03	1 26
1	4 47	15 01	6 16	18 59	1 21
2	5 33	15 00	6 15	18 56	1 17
3	6 17	15 00	6 13	18 52	1 13

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.2	0.2	0.1
30	0.2	0.2	0.1
45	0.2	0.2	0.1
60	0.2	0.2	0.1
75	0.2	0.1	0.1
90	0.2	0.0	0.0

Moon's Lower Limb — Add

Alt.	30	1	2
°	′	′	′
0	12.1	12.0	12.2
4	12.1	12.0	12.3
8	12.2	12.0	12.3
12	12.2	12.1	12.3
16	12.2	12.1	12.4
20	12.3	12.2	12.4
24	12.4	12.3	12.5
28	12.5	12.4	12.6
32	12.6	12.5	12.7
36	12.7	12.6	12.8
40	12.8	12.7	12.9
44	12.9	12.8	13.0
48	13.1	13.0	13.2
52	13.2	13.1	13.3
56	13.4	13.3	13.5
60	13.5	13.5	13.6
64	13.7	13.6	13.8
68	13.9	13.8	14.0
72	14.1	14.0	14.1
76	14.3	14.2	14.3
80	14.4	14.4	14.5
84	14.6	14.6	14.7
88	14.8	14.7	14.8
90			

Add to table, back cover

Moon's Upper Limb — Subtract

Alt.	30	1	2
°	′	′	′
0	17.5	17.6	17.4
4	17.5	17.6	17.4
8	17.5	17.5	17.4
12	17.4	17.5	17.4
16	17.4	17.5	17.3
20	17.3	17.4	17.3
24	17.2	17.3	17.2
28	17.2	17.2	17.1
32	17.1	17.1	17.0
36	16.9	17.0	16.9
40	16.8	16.9	16.8
44	16.7	16.7	16.6
48	16.6	16.6	16.5
52	16.4	16.4	16.4
56	16.2	16.3	16.2
60	16.1	16.1	16.1
64	15.9	15.9	15.9
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.2
84	15.0	15.0	15.0
88	14.9	14.8	14.9
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −4.2 GHA	VENUS −4.2 Dec.	MARS 0.2 GHA	MARS 0.2 Dec.	JUPITER −1.7 GHA	JUPITER −1.7 Dec.	SATURN 0.3 GHA	SATURN 0.3 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
3 00	220 52.0	134 59.1	+27 25.8	266 33.5	−18 55.7	76 16.9	+15 15.4	341 43.7	−18 08.0	268 32.0	143	−12 55.8	+ 92
01	235 54.5	149 59.4	25.9	281 34.4	55.4	91 19.3	15.3	356 46.4	07.9	283 05.3	144	12 46.6	+ 93
02	250 57.0	164 59.8	25.9	296 35.3	55.0	106 21.6	15.3	11 49.0	07.9	297 38.7	144	12 37.3	+ 94
03	265 59.4	180 00.1	26.0	311 36.1	54.7	121 24.0	15.2	26 51.6	07.9	312 12.1	144	−12 27.9	+ 94
04	281 01.9	195 00.4	26.1	326 37.0	54.3	136 26.3	15.2	41 54.3	07.8	326 45.5	144	12 18.5	+ 95
05	296 04.4	210 00.8	26.1	341 37.8	53.9	151 28.7	15.2	56 56.9	07.8	341 18.9	145	12 09.0	+ 95
06	311 06.8	225 01.1	+27 26.2	356 38.7	−18 53.6	166 31.0	+15 15.1	71 59.6	−18 07.8	355 52.4	144	−11 59.5	+ 96
07	326 09.3	240 01.5	26.3	11 39.6	53.2	181 33.4	15.1	87 02.2	07.7	10 25.8	145	11 49.9	+ 96
08	341 11.8	255 01.8	26.3	26 40.4	52.9	196 35.7	15.0	102 04.8	07.7	24 59.3	145	11 40.3	+ 97
09	356 14.2	270 02.1	26.4	41 41.3	52.5	211 38.1	15.0	117 07.5	07.6	39 32.8	146	−11 30.6	+ 98
10	11 16.7	285 02.5	26.4	56 42.2	52.1	226 40.4	14.9	132 10.1	07.6	54 06.4	145	11 20.8	+ 98
11	26 19.1	300 02.8	26.5	71 43.0	51.8	241 42.8	14.9	147 12.8	07.6	68 39.9	145	11 11.0	+ 98
12	41 21.6	315 03.2	+27 26.6	86 43.9	−18 51.4	256 45.1	+15 14.9	162 15.4	−18 07.5	83 13.4	146	−11 01.2	+ 99
13	56 24.1	330 03.5	26.6	101 44.7	51.1	271 47.5	14.8	177 18.0	07.5	97 47.0	146	10 51.3	+100
14	71 26.5	345 03.9	26.7	116 45.6	50.7	286 49.8	14.8	192 20.7	07.5	112 20.6	146	10 41.3	+100
15	86 29.0	0 04.3	26.7	131 46.5	50.4	301 52.1	14.7	207 23.3	07.4	126 54.2	146	−10 31.3	+101
16	101 31.5	15 04.6	26.8	146 47.3	50.0	316 54.5	14.7	222 26.0	07.4	141 27.8	146	10 21.2	+101
17	116 33.9	30 05.0	26.9	161 48.2	49.6	331 56.8	14.6	237 28.6	07.4	156 01.4	146	10 11.1	+101
18	131 36.4	45 05.3	+27 26.9	176 49.1	−18 49.3	346 59.2	+15 14.6	252 31.3	−18 07.3	170 35.0	147	−10 01.0	+102
19	146 38.9	60 05.7	27.0	191 49.9	48.9	2 01.5	14.5	267 33.9	07.3	185 08.7	146	9 50.8	+103
20	161 41.3	75 06.1	27.0	206 50.8	48.6	17 03.9	14.5	282 36.5	07.2	199 42.3	147	9 40.5	+103
21	176 43.8	90 06.4	27.1	221 51.7	48.2	32 06.2	14.5	297 39.2	07.2	214 16.0	146	9 30.2	+103
22	191 46.3	105 06.8	27.1	236 52.5	47.8	47 08.6	14.4	312 41.8	07.2	228 49.6	147	9 19.9	+104
23	206 48.7	120 07.2	27.2	251 53.4	47.5	62 10.9	14.4	327 44.5	07.1	243 23.3	147	9 09.5	+104
4 00	221 51.2	135 07.5	+27 27.2	266 54.3	−18 47.1	77 13.3	+15 14.3	342 47.1	−18 07.1	257 57.0	147	− 8 59.1	+105
01	236 53.6	150 07.9	27.3	281 55.1	46.8	92 15.6	14.3	357 49.8	07.1	272 30.7	147	8 48.6	+105
02	251 56.1	165 08.3	27.3	296 56.0	46.4	107 18.0	14.2	12 52.4	07.0	287 04.4	147	8 38.1	+106
03	266 58.6	180 08.7	27.4	311 56.9	46.0	122 20.3	14.2	27 55.0	07.0	301 38.1	147	8 27.5	+106
04	282 01.0	195 09.1	27.4	326 57.7	45.7	137 22.6	14.1	42 57.7	07.0	316 11.8	147	8 16.9	+107
05	297 03.5	210 09.4	27.5	341 58.6	45.3	152 25.0	14.1	58 00.3	06.9	330 45.5	147	8 06.2	+107
06	312 06.0	225 09.8	+27 27.5	356 59.5	−18 44.9	167 27.3	+15 14.0	73 03.0	−18 06.9	345 19.2	147	− 7 55.5	+107
07	327 08.4	240 10.2	27.5	12 00.4	44.6	182 29.7	14.0	88 05.6	06.8	359 52.9	147	7 44.8	+108
08	342 10.9	255 10.6	27.6	27 01.2	44.2	197 32.0	14.0	103 08.2	06.8	14 26.6	147	7 34.0	+108
09	357 13.4	270 11.0	27.6	42 02.1	43.9	212 34.4	13.9	118 10.9	06.8	29 00.3	147	7 23.2	+109
10	12 15.8	285 11.4	27.7	57 03.0	43.5	227 36.7	13.9	133 13.5	06.7	43 34.0	147	7 12.3	+109
11	27 18.3	300 11.8	27.7	72 03.8	43.1	242 39.0	13.8	148 16.2	06.7	58 07.7	148	7 01.4	+109
12	42 20.8	315 12.2	+27 27.8	87 04.7	−18 42.8	257 41.4	+15 13.8	163 18.8	−18 06.7	72 41.5	147	− 6 50.5	+110
13	57 23.2	330 12.5	27.8	102 05.6	42.4	272 43.7	13.7	178 21.5	06.6	87 15.2	147	6 39.5	+110
14	72 25.7	345 12.9	27.8	117 06.4	42.1	287 46.1	13.7	193 24.1	06.6	101 48.9	146	6 28.5	+110
15	87 28.1	0 13.3	27.9	132 07.3	41.7	302 48.4	13.6	208 26.8	06.6	116 22.5	147	6 17.5	+111
16	102 30.6	15 13.7	27.9	147 08.2	41.3	317 50.7	13.6	223 29.4	06.5	130 56.2	147	6 06.4	+111
17	117 33.1	30 14.2	27.9	162 09.1	41.0	332 53.1	13.5	238 32.0	06.5	145 29.9	147	5 55.3	+112
18	132 35.5	45 14.6	+27 28.0	177 09.9	−18 40.6	347 55.4	+15 13.5	253 34.7	−18 06.4	160 03.6	147	− 5 44.1	+112
19	147 38.0	60 15.0	28.0	192 10.8	40.2	2 57.8	13.4	268 37.3	06.4	174 37.3	146	5 32.9	+112
20	162 40.5	75 15.4	28.0	207 11.7	39.9	18 00.1	13.4	283 40.0	06.4	189 10.9	147	5 21.7	+113
21	177 42.9	90 15.8	28.1	222 12.5	39.5	33 02.4	13.3	298 42.6	06.3	203 44.6	146	5 10.4	+113
22	192 45.4	105 16.2	28.1	237 13.4	39.1	48 04.8	13.3	313 45.3	06.3	218 18.2	146	4 59.1	+113
23	207 47.9	120 16.6	28.1	252 14.3	38.8	63 07.1	13.3	328 47.9	06.3	232 51.8	147	4 47.8	+113
5 00	222 50.3	135 17.0	+27 28.2	267 15.2	−18 38.4	78 09.5	+15 13.2	343 50.5	−18 06.2	247 25.5	146	− 4 36.5	+114
01	237 52.8	150 17.4	28.2	282 16.0	38.1	93 11.8	13.2	358 53.2	06.2	261 59.1	145	4 25.1	+114
02	252 55.2	165 17.9	28.2	297 16.9	37.7	108 14.1	13.1	13 55.8	06.2	276 32.6	146	4 13.7	+115
03	267 57.7	180 18.3	28.3	312 17.8	37.3	123 16.5	13.1	28 58.5	06.1	291 06.2	146	4 02.2	+114
04	283 00.2	195 18.7	28.3	327 18.7	37.0	138 18.8	13.0	44 01.1	06.1	305 39.8	145	3 50.8	+115
05	298 02.6	210 19.1	28.3	342 19.5	36.6	153 21.1	13.0	59 03.8	06.0	320 13.3	145	3 39.3	+116
06	313 05.1	225 19.6	+27 28.3	357 20.4	−18 36.2	168 23.5	+15 12.9	74 06.4	−18 06.0	334 46.8	145	− 3 27.7	+115
07	328 07.6	240 20.0	28.4	12 21.3	35.9	183 25.8	12.9	89 09.1	06.0	349 20.3	145	3 16.2	+116
08	343 10.0	255 20.4	28.4	27 22.2	35.5	198 28.1	12.8	104 11.7	05.9	3 53.8	145	3 04.6	+116
09	358 12.5	270 20.8	28.4	42 23.0	35.1	213 30.5	12.8	119 14.3	05.9	18 27.3	144	− 2 53.0	+116
10	13 15.0	285 21.3	28.4	57 23.9	34.8	228 32.8	12.7	134 17.0	05.9	33 00.7	144	2 41.4	+117
11	28 17.4	300 21.7	28.4	72 24.8	34.4	243 35.1	12.7	149 19.6	05.8	47 34.1	144	2 29.7	+116
12	43 19.9	315 22.2	+27 28.5	87 25.7	−18 34.0	258 37.5	+15 12.6	164 22.3	−18 05.8	62 07.5	144	− 2 18.1	+117
13	58 22.4	330 22.6	28.5	102 26.5	33.7	273 39.8	12.6	179 24.9	05.7	76 40.9	144	2 06.4	+118
14	73 24.8	345 23.0	28.5	117 27.4	33.3	288 42.1	12.5	194 27.6	05.7	91 14.3	143	1 54.6	+117
15	88 27.3	0 23.5	28.5	132 28.3	33.0	303 44.5	12.5	209 30.2	05.7	105 47.6	143	− 1 42.9	+118
16	103 29.7	15 23.9	28.5	147 29.2	32.6	318 46.8	12.4	224 32.9	05.6	120 20.9	143	1 31.1	+117
17	118 32.2	30 24.4	28.6	162 30.0	32.2	333 49.1	12.4	239 35.5	05.6	134 54.2	142	1 19.4	+118
18	133 34.7	45 24.8	+27 28.6	177 30.9	−18 31.9	348 51.5	+15 12.3	254 38.1	−18 05.6	149 27.4	142	− 1 07.6	+119
19	148 37.1	60 25.3	28.6	192 31.8	31.5	3 53.8	12.3	269 40.8	05.5	164 00.6	142	0 55.7	+118
20	163 39.6	75 25.7	28.6	207 32.7	31.1	18 56.1	12.2	284 43.4	05.5	178 33.8	142	0 43.9	+119
21	178 42.1	90 26.2	28.6	222 33.5	30.8	33 58.5	12.2	299 46.1	05.5	193 07.0	141	0 32.0	+118
22	193 44.5	105 26.6	28.6	237 34.4	30.4	49 00.8	12.1	314 48.7	05.4	207 40.1	141	0 20.2	+119
23	208 47.0	120 27.1	28.6	252 35.3	30.0	64 03.1	12.1	329 51.4	05.4	222 13.2	140	− 0 08.3	+119
24	223 49.5	135 27.6	+27 28.6	267 36.2	−18 29.7	79 05.5	+15 12.0	344 54.0	−18 05.3	236 46.2	140	+ 0 03.6	+119
code	-	+ 3	0	+ 9	+ 4	+ 23	− 1	+ 27	+ 1				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
3 0	180 47.1	+15 36.1	7	Acamar	315 51.2	−40 28.8
1	195 47.1	36.8	5	Achernar	335 59.1	−57 27.4
2	210 47.2	37.6	30	Acrux	173 56.7	−62 51.8
3	225 47.3	.. 38.3	19	Adhara	255 46.4	−28 55.0
4	240 47.3	39.0	10	Aldebaran	291 38.9	+16 25.3
5	255 47.4	39.8				
6	270 47.5	+15 40.5	32	Alioth	166 57.7	+56 11.8
7	285 47.5	41.2	34	Alkaid	153 32.1	+49 31.8
8	300 47.6	42.0	55	Al Na'ir	28 37.5	−47 10.1
9	315 47.7	.. 42.7	15	Alnilam	276 30.1	− 1 13.8
10	330 47.7	43.4	25	Alphard	218 38.1	− 8 28.4
11	345 47.8	44.2				
12	0 47.9	+15 44.9	41	Alphecca	126 46.9	+26 51.5
13	15 47.9	45.6	1	Alpheratz	358 28.1	+28 50.9
14	30 48.0	46.4	51	Altair	62 49.9	+ 8 45.1
15	45 48.1	.. 47.1	2	Ankaa	353 58.2	−42 32.4
16	60 48.1	47.8	42	Antares	113 18.5	−26 20.2
17	75 48.2	48.6				
18	90 48.3	+15 49.3	37	Arcturus	146 34.4	+19 24.4
19	105 48.3	50.0	43	Atria	108 58.3	−68 56.9
20	120 48.4	50.8	22	Avior	234 35.7	−59 22.5
21	135 48.4	.. 51.5	13	Bellatrix	279 18.2	+ 6 18.6
22	150 48.5	52.2	16	Betelg'se	271 47.9	+ 7 23.9
23	165 48.6	52.9				
			17	Canopus	264 15.5	−52 40.6
4 0	180 48.6	+15 53.7	12	Capella	281 38.2	+45 57.4
1	195 48.7	54.4	53	Deneb	50 00.6	+45 07.2
2	210 48.7	55.1	28	Denebola	183 17.1	+14 48.8
3	225 48.8	.. 55.8	4	Diphda	349 39.1	−18 13.5
4	240 48.9	56.6				
5	255 48.9	57.3	27	Dubhe	194 43.8	+61 59.3
6	270 49.0	+15 58.0	14	Elnath	279 07.1	+28 34.3
7	285 49.0	58.7	47	Eltanin	91 05.6	+51 29.4
8	300 49.1	15 59.5	54	Enif	34 29.2	+ 9 40.4
9	315 49.2	-16 00.2	56	Fomalhaut	16 11.3	−29 51.1
10	330 49.2	00.9				
11	345 49.3	01.6	31	Gacrux	172 48.3	−56 52.5
12	0 49.3	+16 02.4	29	Gienah	176 36.2	−17 18.2
13	15 49.4	03.1	35	Hadar	149 48.1	−60 10.0
14	30 49.5	03.8	6	Hamal	328 49.5	+23 15.4
15	45 49.5	.. 04.5	48	Kaus Aust.	84 40.3	−34 24.3
16	60 49.6	05.2				
17	75 49.6	06.0	40	Kochab	137 16.8	+74 20.0
18	90 49.7	+16 06.7	57	Markab	14 21.2	+14 58.1
19	105 49.7	07.4	8	Menkar	315 00.2	+ 3 55.1
20	120 49.8	08.1	36	Menkent	148 57.7	−36 09.6
21	135 49.9	.. 08.8	24	Miapl'dus	221 48.9	−69 32.7
22	150 49.9	09.5				
23	165 50.0	10.3	9	Mirfak	309 42.2	+49 42.4
			50	Nunki	76 51.1	−26 21.1
5 0	180 50.0	+16 11.0	52	Peacock	54 26.5	−56 52.3
1	195 50.1	11.7	21	Pollux	244 20.2	+28 08.0
2	210 50.1	12.4	20	Procyon	245 44.7	+ 5 20.1
3	225 50.2	.. 13.1				
4	240 50.2	13.8	46	R'alhague	96 45.9	+12 35.3
5	255 50.3	14.6	26	Regulus	208 29.0	+12 10.7
6	270 50.3	+16 15.3	11	Rigel	281 53.5	− 8 15.2
7	285 50.4	16.0	38	Rigil Kent.	140 49.7	−60 39.6
8	300 50.5	16.7	44	Sabik	103 01.4	−15 40.4
9	315 50.5	.. 17.4				
10	330 50.6	18.1	3	Schedar	350 29.9	+56 17.8
11	345 50.6	18.8	45	Shaula	97 19.7	−37 04.4
12	0 50.7	+16 19.5	18	Sirius	259 11.7	−16 39.5
13	15 50.7	20.3	33	Spica	159 16.1	−10 56.2
14	30 50.8	21.0	23	Suhail	223 24.0	−43 15.7
15	45 50.8	.. 21.7				
16	60 50.9	22.4	49	Vega	81 07.7	+38 44.4
17	75 50.9	23.1	39	Zub'g'bi	137 52.5	−15 51.8
18	90 51.0	+16 23.8				
19	105 51.0	24.5				
20	120 51.1	25.2				
21	135 51.1	.. 25.9				
22	150 51.2	26.6				
23	165 51.2	27.3				
24	180 51.3	+16 28.0				
code	—	+ 7				

Lat. N °	Sunrise h m	Twlt. begins h m	Moonrise 3 h m	4 h m	5 h m	6 h m
72	1 24	////	3 04	2 44	2 28	2 12
70	2 13	////	2 42	2 31	2 22	2 13
68	2 43	////	2 25	2 21	2 17	2 13
66	3 06	////	2 11	2 13	2 13	2 14
64	3 23	////	2 00	2 05	2 10	2 14
62	3 38	////	1 50	1 59	2 07	2 14
60	3 50	////	1 41	1 54	2 04	2 14
58	4 00	////	1 34	1 49	2 02	2 15
56	4 09	0 15	1 27	1 44	2 00	2 15
54	4 18	1 19	1 21	1 40	1 58	2 15
52	4 25	1 49	1 16	1 37	1 56	2 15
50	4 31	2 10	1 11	1 34	1 55	2 15
45	4 45	2 48	1 01	1 27	1 51	2 16
40	4 57	3 13	0 52	1 21	1 48	2 16
35	5 06	3 32	0 44	1 16	1 46	2 16
30	5 15	3 47	0 38	1 11	1 44	2 16
20	5 29	4 12	0 26	1 03	1 40	2 17
10	5 42	4 29	0 16	0 57	1 37	2 17
0	5 53	4 42	0 06	0 50	1 34	2 18
10	6 05	4 53	24 44	0 44	1 30	2 18
20	6 17	5 02	24 37	0 37	1 27	2 18
30	6 31	5 09	24 29	0 29	1 23	2 19
35	6 39	5 12	24 24	0 24	1 21	2 19
40	6 48	5 15	24 19	0 19	1 18	2 19
45	6 58	5 17	24 13	0 13	1 16	2 20
50	7 11	5 20	24 06	0 06	1 12	2 20
52	7 17	5 19	24 02	0 02	1 11	2 21
54	7 23	5 21	23 58	25 09	1 09	2 21
56	7 31	5 21	23 54	25 07	1 07	2 21
58	7 39	5 21	23 50	25 05	1 05	2 22
60	7 48	5 22	23 45	25 02	1 02	2 22

Lat. N °	Sunset h m	Twlt. ends h m	Moonset 3 h m	4 h m	5 h m	6 h m
72	22 39	////	9 49	11 40	13 28	15 18
70	21 46	////	10 09	11 50	13 31	15 13
68	21 14	////	10 25	11 59	13 33	15 10
66	20 51	////	10 38	12 06	13 35	15 07
64	20 33	////	10 48	12 12	13 37	15 05
62	20 18	////	10 57	12 17	13 39	15 02
60	20 05	////	11 05	12 21	13 40	15 01
58	19 55	////	11 11	12 25	13 41	14 59
56	19 45	////	11 17	12 29	13 42	14 57
54	19 37	22 42	11 22	12 32	13 43	14 56
52	19 30	22 10	11 27	12 35	13 44	14 55
50	19 23	21 48	11 32	12 37	13 45	14 54
45	19 09	21 09	11 41	12 43	13 46	14 51
40	18 58	20 43	11 48	12 47	13 48	14 49
35	18 48	20 23	11 55	12 51	13 49	14 48
30	18 39	20 07	12 01	12 55	13 50	14 46
20	18 25	19 43	12 11	13 01	13 52	14 44
10	18 12	19 26	12 19	13 06	13 53	14 41
0	18 00	19 12	12 28	13 11	13 54	14 39
10	17 49	19 01	12 36	13 16	13 56	14 37
20	17 36	18 51	12 44	13 21	13 57	14 35
30	17 22	18 44	12 54	13 27	13 59	14 32
35	17 14	18 40	12 59	13 30	14 00	14 30
40	17 05	18 37	13 06	13 34	14 01	14 29
45	16 55	18 35	13 13	13 38	14 02	14 27
50	16 42	18 33	13 21	13 43	14 04	14 24
52	16 36	18 32	13 25	13 45	14 04	14 23
54	16 29	18 31	13 30	13 48	14 05	14 22
56	16 22	18 30	13 35	13 51	14 06	14 21
58	16 14	18 30	13 40	13 54	14 06	14 19
60	16 04	18 29	13 46	13 57	14 07	14 18

GMT h	Equation of Time (App. Mean) 3 m s	4 m s	5 m s
0	+ 3 08.2	+ 3 14.4	+ 3 20.0
6	+ 3 09.8	+ 3 15.8	+ 3 21.3
12	+ 3 11.4	+ 3 17.2	+ 3 22.5
18	+ 3 12.9	+ 3 18.6	+ 3 23.8
24	+ 3 14.4	+ 3 20.0	+ 3 25.0

GMT of Transit
Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
3	6 17	15 00	6 13	18 52	1 13
4	7 01	14 59	6 12	18 48	1 09
5	7 44	14 58	6 11	18 44	1 04
6	8 28	14 58	6 09	18 41	1 00

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.2	0.3	0.1
30	0.2	0.2	0.1
45	0.2	0.2	0.1
60	0.2	0.1	0.1
75	0.2	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt. °	3 ′	4 ′	5 ′
0	12.6	13.1	13.9
4	12.6	13.1	13.9
8	12.7	13.2	13.9
12	12.7	13.2	13.9
16	12.7	13.2	14.0
20	12.8	13.3	14.0
24	12.9	13.3	14.0
28	12.9	13.4	14.1
32	13.0	13.5	14.1
36	13.1	13.5	14.2
40	13.2	13.6	14.2
44	13.3	13.7	14.3
48	13.4	13.8	14.4
52	13.6	13.9	14.4
56	13.7	14.0	14.5
60	13.8	14.1	14.6
64	14.0	14.3	14.7
68	14.1	14.4	14.8
72	14.3	14.5	14.8
76	14.4	14.6	14.9
80	14.6	14.8	15.0
84	14.8	14.9	15.1
88	14.9	15.0	15.2
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt. °	3 ′	4 ′	5 ′
0	17.2	16.9	16.5
4	17.2	16.9	16.5
8	17.2	16.9	16.5
12	17.2	16.9	16.5
16	17.1	16.8	16.4
20	17.1	16.8	16.4
24	17.0	16.7	16.4
28	16.9	16.7	16.3
32	16.8	16.6	16.3
36	16.7	16.5	16.2
40	16.6	16.4	16.2
44	16.5	16.4	16.1
48	16.4	16.3	16.0
52	16.3	16.2	16.0
56	16.1	16.0	15.9
60	16.0	15.9	15.8
64	15.9	15.8	15.7
68	15.7	15.7	15.6
72	15.6	15.6	15.6
76	15.4	15.4	15.5
80	15.2	15.3	15.4
84	15.1	15.2	15.3
88	15.0	15.1	15.2
90			

Subtract from table, back cover

Last Quarter 3

GMT	♈	VENUS −4.2		MARS 0.2		JUPITER −1.7		SATURN 0.3		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
6 00	223 49.5	135 27.6	+27 28.6	267 36.2	−18 29.7	79 05.5	+15 12.0	344 54.0	−18 05.3	236 46.2	140	+ 0 03.6	+119
01	238 51.9	150 28.0	28.7	282 37.1	29.3	94 07.8	12.0	359 56.7	05.3	251 19.2	140	0 15.5	+119
02	253 54.4	165 28.5	28.7	297 37.9	28.9	109 10.1	11.9	14 59.3	05.3	265 52.2	140	0 27.4	+120
03	268 56.8	180 29.0	·· 28.7	312 38.8	·· 28.6	124 12.5	·· 11.9	30 02.0	·· 05.2	280 25.2	139	· 0 39.4	+119
04	283 59.3	195 29.4	28.7	327 39.7	28.2	139 14.8	11.8	45 04.6	05.2	294 58.1	139	0 51.3	+120
05	299 01.8	210 29.9	28.7	342 40.6	27.8	154 17.1	11.8	60 07.2	05.2	309 31.0	138	1 03.3	+119
06	314 04.2	225 30.4	+27 28.7	357 41.5	−18 27.5	169 19.4	+15 11.7	75 09.9	−18 05.1	324 03.8	138	+ 1 15.2	+120
07	329 06.7	240 30.9	28.7	12 42.3	27.1	184 21.8	11.7	90 12.5	05.1	338 36.6	137	1 27.2	+120
08	344 09.2	255 31.3	28.7	27 43.2	26.7	199 24.1	11.6	105 15.2	05.0	353 09.3	137	1 39.2	+120
09	359 11.6	270 31.8	·· 28.7	42 44.1	·· 26.3	214 26.4	·· 11.6	120 17.8	·· 05.0	7 42.0	137	· 1 51.2	+120
10	14 14.1	285 32.3	28.7	57 45.0	26.0	229 28.8	11.5	135 20.5	05.0	22 14.7	136	2 03.2	+120
11	29 16.6	300 32.8	28.7	72 45.9	25.6	244 31.1	11.5	150 23.1	04.9	36 47.3	136	2 15.2	+120
12	44 19.0	315 33.3	+27 28.7	87 46.8	−18 25.2	259 33.4	+15 11.4	165 25.8	−18 04.9	51 19.9	135	+ 2 27.2	+120
13	59 21.5	330 33.7	28.7	102 47.6	24.9	274 35.7	11.4	180 28.4	04.9	65 52.4	135	2 39.2	+120
14	74 24.0	345 34.2	28.7	117 48.5	24.5	289 38.1	11.3	195 31.1	04.8	80 24.9	135	2 51.2	+120
15	89 26.4	0 34.7	·· 28.7	132 49.4	·· 24.1	304 40.4	·· 11.3	210 33.7	·· 04.8	94 57.4	134	· 3 03.2	+120
16	104 28.9	15 35.2	28.7	147 50.3	23.8	319 42.7	11.2	225 36.4	04.8	109 29.8	133	3 15.2	+121
17	119 31.3	30 35.7	28.7	162 51.2	23.4	334 45.0	11.2	240 39.0	04.7	124 02.1	133	3 27.3	+120
18	134 33.8	45 36.2	+27 28.7	177 52.1	−18 23.0	349 47.4	+15 11.1	255 41.6	−18 04.7	138 34.4	132	+ 3 39.3	+120
19	149 36.3	60 36.7	28.7	192 52.9	22.7	4 49.7	11.1	270 44.3	04.6	153 06.6	132	3 51.3	+120
20	164 38.7	75 37.2	28.7	207 53.8	22.3	19 52.0	11.0	285 46.9	04.6	167 38.8	131	4 03.3	+120
21	179 41.2	90 37.7	·· 28.7	222 54.7	·· 21.9	34 54.3	·· 11.0	300 49.6	·· 04.6	182 10.9	131	· 4 15.3	+120
22	194 43.7	105 38.2	28.7	237 55.6	21.6	49 56.7	10.9	315 52.2	04.5	196 43.0	130	4 27.3	+120
23	209 46.1	120 38.7	28.7	252 56.5	21.2	64 59.0	10.9	330 54.9	04.5	211 15.0	130	4 39.3	+120
7 00	224 48.6	135 39.2	+27 28.7	267 57.4	−18 20.8	80 01.3	+15 10.8	345 57.5	−18 04.5	225 47.0	129	+ 4 51.3	+120
01	239 51.1	150 39.8	28.7	282 58.2	20.4	95 03.6	10.8	1 00.2	04.4	240 18.9	129	5 03.3	+119
02	254 53.5	165 40.3	28.6	297 59.1	20.1	110 06.0	10.7	16 02.8	04.4	254 50.8	128	5 15.2	+120
03	269 56.0	180 40.8	·· 28.6	313 00.0	·· 19.7	125 08.3	·· 10.7	31 05.5	·· 04.3	269 22.6	127	· 5 27.2	+119
04	284 58.5	195 41.3	28.6	328 00.9	19.3	140 10.6	10.6	46 08.1	04.3	283 54.3	127	5 39.1	+120
05	300 00.9	210 41.8	28.6	343 01.8	19.0	155 12.9	10.5	61 10.8	04.3	298 26.0	126	5 51.1	+119
06	315 03.4	225 42.3	+27 28.6	358 02.7	−18 18.6	170 15.3	+15 10.5	76 13.4	−18 04.2	312 57.6	126	+ 6 03.0	+119
07	330 05.8	240 42.9	28.6	13 03.6	18.2	185 17.6	10.4	91 16.1	04.2	327 29.2	124	6 14.9	+119
08	345 08.3	255 43.4	28.6	28 04.4	17.9	200 19.9	10.4	106 18.7	04.2	342 00.6	125	6 26.8	+119
09	0 10.8	270 43.9	·· 28.5	43 05.3	·· 17.5	215 22.2	·· 10.3	121 21.3	·· 04.1	356 32.1	123	· 6 38.7	+118
10	15 13.2	285 44.4	28.5	58 06.2	17.1	230 24.5	10.3	136 24.0	04.1	11 03.4	123	6 50.5	+119
11	30 15.7	300 45.0	28.5	73 07.1	16.7	245 26.9	10.2	151 26.6	04.0	25 34.7	123	7 02.4	+118
12	45 18.2	315 45.5	+27 28.5	88 08.0	−18 16.4	260 29.2	+15 10.2	166 29.3	−18 04.0	40 06.0	121	+ 7 14.2	+118
13	60 20.6	330 46.0	28.5	103 08.9	16.0	275 31.5	10.1	181 31.9	04.0	54 37.1	121	7 26.0	+118
14	75 23.1	345 46.6	28.5	118 09.8	15.6	290 33.8	10.1	196 34.6	03.9	69 08.2	120	7 37.8	+118
15	90 25.6	0 47.1	·· 28.4	133 10.7	·· 15.3	305 36.1	·· 10.0	211 37.2	·· 03.9	83 39.2	120	· 7 49.6	+117
16	105 28.0	15 47.7	28.4	148 11.5	14.9	320 38.5	10.0	226 39.9	03.9	98 10.2	119	8 01.3	+117
17	120 30.5	30 48.2	28.4	163 12.4	14.5	335 40.8	09.9	241 42.5	03.8	112 41.1	118	8 13.0	+117
18	135 33.0	45 48.8	+27 28.4	178 13.3	−18 14.1	350 43.1	+15 09.9	256 45.2	−18 03.8	127 11.9	117	+ 8 24.7	+116
19	150 35.4	60 49.3	28.3	193 14.2	13.8	5 45.4	09.8	271 47.8	03.7	141 42.6	117	8 36.3	+117
20	165 37.9	75 49.9	28.3	208 15.1	13.4	20 47.7	09.7	286 50.5	03.7	156 13.3	116	8 48.0	+116
21	180 40.3	90 50.4	·· 28.3	223 16.0	·· 13.0	35 50.1	·· 09.7	301 53.1	·· 03.7	170 43.9	115	· 8 59.6	+115
22	195 42.8	105 51.0	28.3	238 16.9	12.7	50 52.4	09.6	316 55.8	03.6	185 14.4	115	9 11.1	+116
23	210 45.3	120 51.5	28.2	253 17.8	12.3	65 54.7	09.6	331 58.4	03.6	199 44.9	113	9 22.7	+115
8 00	225 47.7	135 52.1	+27 28.2	268 18.7	−18 11.9	80 57.0	+15 09.5	347 01.1	−18 03.6	214 15.2	113	+ 9 34.2	+114
01	240 50.2	150 52.6	28.2	283 19.6	11.5	95 59.3	09.5	2 03.7	03.5	228 45.5	113	9 45.6	+115
02	255 52.7	165 53.2	28.2	298 20.5	11.2	111 01.6	09.4	17 06.4	03.5	243 15.8	111	9 57.1	+113
03	270 55.1	180 53.8	·· 28.1	313 21.3	·· 10.8	126 04.0	·· 09.4	32 09.0	·· 03.5	257 45.9	111	· 10 08.4	+114
04	285 57.6	195 54.3	28.1	328 22.2	10.4	141 06.3	09.3	47 11.7	03.4	272 16.0	109	10 19.8	+113
05	301 00.1	210 54.9	28.1	343 23.1	10.0	156 08.6	09.3	62 14.3	03.4	286 45.9	109	10 31.1	+113
06	316 02.5	225 55.5	+27 28.0	358 24.0	−18 09.7	171 10.9	+15 09.2	77 17.0	−18 03.3	301 15.8	109	+ 10 42.4	+112
07	331 05.0	240 56.1	28.0	13 24.9	09.3	186 13.2	09.1	92 19.6	03.3	315 45.7	107	10 53.6	+112
08	346 07.4	255 56.6	28.0	28 25.8	08.9	201 15.5	09.1	107 22.2	03.3	330 15.4	106	11 04.8	+111
09	1 09.9	270 57.2	·· 27.9	43 26.7	·· 08.5	216 17.8	·· 09.0	122 24.9	·· 03.2	344 45.0	106	· 11 15.9	+111
10	16 12.4	285 57.8	27.9	58 27.6	08.2	231 20.2	09.0	137 27.5	03.2	359 14.6	105	11 27.0	+111
11	31 14.8	300 58.4	27.9	73 28.5	07.8	246 22.5	08.9	152 30.2	03.2	13 44.1	104	11 38.1	+110
12	46 17.3	315 59.0	+27 27.8	88 29.4	−18 07.4	261 24.8	+15 08.9	167 32.8	−18 03.1	28 13.5	103	+ 11 49.1	+109
13	61 19.8	330 59.5	27.8	103 30.3	07.1	276 27.1	08.8	182 35.5	03.1	42 42.8	103	12 00.0	+109
14	76 22.2	346 00.1	27.8	118 31.2	06.7	291 29.4	08.8	197 38.1	03.0	57 12.1	101	12 10.9	+108
15	91 24.7	1 00.7	·· 27.7	133 32.1	·· 06.3	306 31.7	·· 08.7	212 40.8	·· 03.0	71 41.2	101	· 12 21.7	+108
16	106 27.2	16 01.3	27.7	148 33.0	05.9	321 34.0	08.6	227 43.4	03.0	86 10.3	100	12 32.5	+107
17	121 29.6	31 01.9	27.6	163 33.9	05.6	336 36.3	08.6	242 46.1	02.9	100 39.3	99	12 43.2	+107
18	136 32.1	46 02.5	+27 27.6	178 34.8	−18 05.2	351 38.7	+15 08.5	257 48.7	−18 02.9	115 08.2	98	+ 12 53.9	+106
19	151 34.6	61 03.1	27.6	193 35.7	04.8	6 41.0	08.5	272 51.4	02.9	129 37.0	97	13 04.5	+106
20	166 37.0	76 03.7	27.5	208 36.5	04.4	21 43.3	08.4	287 54.0	02.8	144 05.7	96	13 15.1	+105
21	181 39.5	91 04.3	·· 27.5	223 37.4	·· 04.1	36 45.6	·· 08.4	302 56.7	·· 02.8	158 34.3	96	· 13 25.6	+104
22	196 41.9	106 04.9	27.4	238 38.3	03.7	51 47.9	08.3	317 59.3	02.7	173 02.9	94	13 36.0	+103
23	211 44.4	121 05.5	27.4	253 39.2	03.3	66 50.2	08.2	333 02.0	02.7	187 31.3	94	13 46.3	+103
24	226 46.9	136 06.1	+27 27.3	268 40.1	−18 02.9	81 52.5	+15 08.2	348 04.6	−18 02.7	201 59.7	93	+ 13 56.6	+103
code	—	+ 5		+ 9	+ 4	+ 23	− 1	+ 26	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
6 00	180 51.3	+16 28.0
01	195 51.3	28.7
02	210 51.4	29.4
03	225 51.4	30.1
04	240 51.5	30.8
05	255 51.5	31.5
06	270 51.6	+16 32.2
07	285 51.6	32.9
08	300 51.7	33.6
09	315 51.7	34.3
10	330 51.8	35.0
11	345 51.8	35.7
12	0 51.8	+16 36.5
13	15 51.9	37.1
14	30 51.9	37.8
15	45 52.0	38.5
16	60 52.0	39.2
17	75 52.1	39.9
18	90 52.1	+16 40.6
19	105 52.2	41.3
20	120 52.2	42.0
21	135 52.2	42.7
22	150 52.3	43.4
23	165 52.3	44.1
7 00	180 52.4	+16 44.8
01	195 52.4	45.5
02	210 52.5	46.2
03	225 52.5	46.9
04	240 52.5	47.6
05	255 52.6	48.3
06	270 52.6	+16 49.0
07	285 52.7	49.6
08	300 52.7	50.3
09	315 52.8	51.0
10	330 52.8	51.7
11	345 52.8	52.4
12	0 52.9	+16 53.1
13	15 52.9	53.8
14	30 53.0	54.5
15	45 53.0	55.1
16	60 53.0	55.8
17	75 53.1	56.5
18	90 53.1	+16 57.2
19	105 53.2	57.9
20	120 53.2	58.6
21	135 53.2	59.3
22	150 53.3	16 59.9
23	165 53.3	17 00.6
8 00	180 53.3	+17 01.3
01	195 53.4	02.0
02	210 53.4	02.7
03	225 53.4	03.3
04	240 53.5	04.0
05	255 53.5	04.7
06	270 53.6	+17 05.4
07	285 53.6	06.1
08	300 53.6	06.7
09	315 53.7	07.4
10	330 53.7	08.1
11	345 53.7	08.8
12	0 53.8	+17 09.4
13	15 53.8	10.1
14	30 53.8	10.8
15	45 53.9	11.5
16	60 53.9	12.1
17	75 53.9	12.8
18	90 54.0	+17 13.5
19	105 54.0	14.2
20	120 54.0	14.8
21	135 54.1	15.5
22	150 54.1	16.2
23	165 54.1	16.8
24	180 54.2	+17 17.5
code	—	+ 7

STARS No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 51.2	−40 28.7
5	Achernar	335 59.1	−57 27.3
30	Acrux	173 56.7	−62 51.8
19	Adhara	255 46.4	−28 55.0
10	Aldebaran	291 38.9	+16 25.3
32	Alioth	166 57.7	+56 11.8
34	Alkaid	153 32.1	+49 31.8
55	Al Na'ir	28 37.5	−47 10.1
15	Alnilam	276 30.1	− 1 13.8
25	Alphard	218 38.1	− 8 28.4
41	Alphecca	126 46.9	+26 51.5
1	Alpheratz	358 28.1	+28 50.9
51	Altair	62 49.9	+ 8 45.1
2	Ankaa	353 58.2	−42 32.4
42	Antares	113 18.5	−26 20.2
37	Arcturus	146 34.4	+19 24.4
43	Atria	108 58.3	−68 56.9
22	Avior	234 35.7	−59 22.5
13	Bellatrix	279 18.2	+ 6 18.6
16	Betelg'se	271 47.9	+ 7 23.9
17	Canopus	264 15.5	−52 40.6
12	Capella	281 38.2	+45 57.4
53	Deneb	50 00.6	+45 07.2
28	Denebola	183 17.1	+14 48.8
4	Diphda	349 39.1	−18 13.5
27	Dubhe	194 43.8	+61 59.3
14	Elnath	279 07.1	+28 34.3
47	Eltanin	91 05.6	+51 29.4
54	Enif	34 29.2	+ 9 40.4
56	Fomalhaut	16 11.3	−29 51.1
31	Gacrux	172 48.3	−56 52.5
29	Gienah	176 36.2	−17 18.2
35	Hadar	149 48.1	−60 10.0
6	Hamal	328 49.5	+23 15.4
48	Kaus Aust.	84 40.3	−34 24.3
40	Kochab	137 16.8	+74 20.0
57	Markab	14 21.1	+14 58.2
8	Menkar	315 00.2	+ 3 55.1
36	Menkent	148 57.7	−36 09.6
24	Miapl'dus	221 48.9	−69 32.7
9	Mirfak	309 42.2	+49 42.4
50	Nunki	76 51.1	−26 21.1
52	Peacock	54 26.4	−56 52.3
21	Pollux	244 20.2	+28 08.0
20	Procyon	245 44.7	+ 5 20.1
46	R'alhague	96 45.9	+12 35.3
26	Regulus	208 29.0	+12 10.7
11	Rigel	281 53.5	− 8 15.2
38	Rigil Kent.	140 49.7	−60 39.6
44	Sabik	103 01.4	−15 40.4
3	Schedar	350 29.9	+56 17.8
45	Shaula	97 19.7	−37 04.4
18	Sirius	259 11.7	−16 39.5
33	Spica	159 16.1	−10 56.2
23	Suhail	223 24.0	−43 15.7
49	Vega	81 07.7	+38 44.4
39	Zub'g'bi	137 52.5	−15 51.8

GMT	Equation of Time (App.—Mean) 6	7	8
h	m s	m s	m s
0	+ 3 25.0	+ 3 29.4	+ 3 33.3
6	+ 3 26.2	+ 3 30.4	+ 3 34.2
12	+ 3 27.3	+ 3 31.4	+ 3 35.0
18	+ 3 28.4	+ 3 32.4	+ 3 35.8
24	+ 3 29.4	+ 3 33.3	+ 3 36.6

Lat. N °	Sunrise h m	Twlt. begins h m	Moonrise 6 h m	7 h m	8 h m	9 h m
72	0 46	////	2 12	1 57	1 38	1 14
70	1 53	////	2 13	2 04	1 53	1 41
68	2 29	////	2 13	2 09	2 05	2 02
66	2 54	////	2 14	2 14	2 15	2 19
64	3 13	////	2 14	2 18	2 24	2 32
62	3 29	////	2 14	2 22	2 31	2 44
60	3 42	////	2 14	2 25	2 38	2 54
58	3 53	////	2 15	2 28	2 43	3 02
56	4 03	////	2 15	2 31	2 48	3 10
54	4 12	1 00	2 15	2 33	2 53	3 17
52	4 19	1 36	2 15	2 35	2 57	3 23
50	4 26	2 00	2 15	2 37	3 01	3 28
45	4 41	2 40	2 16	2 41	3 09	3 40
40	4 53	3 08	2 16	2 44	3 16	3 50
35	5 03	3 28	2 16	2 48	3 21	3 59
30	5 12	3 45	2 16	2 50	3 27	4 07
20	5 27	4 09	2 17	2 55	3 36	4 20
10	5 41	4 27	2 17	2 59	3 44	4 32
0	5 53	4 41	2 18	3 03	3 51	4 43
10	6 05	4 53	2 18	3 07	3 59	4 54
20	6 18	5 03	2 18	3 11	4 07	5 06
30	6 33	5 10	2 19	3 16	4 16	5 19
35	6 41	5 14	2 19	3 19	4 22	5 27
40	6 51	5 17	2 19	3 23	4 28	5 36
45	7 02	5 20	2 20	3 26	4 35	5 47
50	7 15	5 23	2 20	3 31	4 44	6 00
52	7 22	5 24	2 21	3 33	4 48	6 06
54	7 29	5 25	2 21	3 35	4 53	6 13
56	7 36	5 25	2 21	3 38	4 58	6 20
58	7 45	5 26	2 22	3 41	5 04	6 29
60	7 55	5 26	2 22	3 44	5 10	6 39

Lat. N °	Sunset h m	Twlt. ends h m	Moonset 6 h m	7 h m	8 h m	9 h m
72	23 28	////	15 18	17 14	19 24	22 13
70	22 06	////	15 13	17 01	18 58	21 09
68	21 28	////	15 10	16 51	18 38	20 34
66	21 02	////	15 07	16 42	18 23	20 09
64	20 42	////	15 05	16 35	18 11	19 49
62	20 26	////	15 02	16 29	18 00	19 34
60	20 13	////	15 01	16 24	17 51	19 20
58	20 01	////	14 59	16 19	17 43	19 09
56	19 51	////	14 57	16 15	17 36	18 59
54	19 43	23 02	14 56	16 12	17 30	18 51
52	19 35	22 23	14 55	16 08	17 25	18 43
50	19 28	21 57	14 54	16 05	17 20	18 36
45	19 13	21 16	14 51	15 59	17 09	18 21
40	19 01	20 48	14 49	15 54	17 00	18 09
35	18 50	20 26	14 48	15 49	16 53	17 59
30	18 41	20 10	14 46	15 45	16 46	17 50
20	18 26	19 45	14 44	15 38	16 35	17 35
10	18 12	19 26	14 41	15 31	16 25	17 21
0	18 00	19 12	14 39	15 26	16 15	17 08
10	17 48	19 01	14 37	15 20	16 06	16 56
20	17 35	18 51	14 35	15 14	15 56	16 42
30	17 20	18 42	14 32	15 07	15 45	16 27
35	17 12	18 39	14 30	15 03	15 38	16 18
40	17 02	18 35	14 29	14 58	15 31	16 08
45	16 51	18 32	14 27	14 53	15 22	15 57
50	16 37	18 28	14 24	14 47	15 12	15 42
52	16 31	18 28	14 23	14 44	15 07	15 36
54	16 24	18 27	14 22	14 41	15 02	15 28
56	16 16	18 25	14 21	14 37	14 56	15 20
58	16 08	18 25	14 19	14 33	14 50	15 11
60	15 58	18 24	14 18	14 29	14 43	15 01

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
6	8 28	14 58	6 09	18 41	1 00
7	9 14	14 57	6 08	18 37	0 56
8	10 03	14 56	6 06	18 33	0 52
9	10 56	14 55	6 05	18 30	0 48

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.2	0.3	0.1
30	0.2	0.2	0.1
45	0.2	0.2	0.1
60	0.2	0.1	0.1
75	0.2	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt. °	6 ′	7 ′	8 ′
0	14.9	15.9	16.9
4	14.9	15.9	16.9
8	14.9	15.9	16.9
12	14.9	15.9	16.9
16	14.9	15.9	16.9
20	15.0	15.9	16.9
24	15.0	15.9	16.8
28	15.0	15.9	16.8
32	15.0	15.9	16.8
36	15.0	15.9	16.7
40	15.0	15.9	16.7
44	15.1	15.8	16.6
48	15.1	15.8	16.6
52	15.1	15.8	16.5
56	15.1	15.8	16.4
60	15.2	15.8	16.4
64	15.2	15.8	16.3
68	15.2	15.7	16.2
72	15.3	15.7	16.2
76	15.3	15.7	16.1
80	15.3	15.7	16.0
84	15.4	15.7	15.9
88	15.4	15.6	15.9
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt. °	6 ′	7 ′	8 ′
0	15.9	15.3	14.8
4	15.9	15.3	14.8
8	15.9	15.3	14.8
12	15.9	15.3	14.8
16	15.9	15.3	14.8
20	15.9	15.4	14.8
24	15.9	15.4	14.9
28	15.8	15.4	14.9
32	15.8	15.4	14.9
36	15.8	15.4	15.0
40	15.8	15.4	15.0
44	15.8	15.4	15.1
48	15.7	15.4	15.1
52	15.7	15.5	15.2
56	15.7	15.5	15.3
60	15.6	15.5	15.3
64	15.6	15.5	15.4
68	15.6	15.5	15.5
72	15.6	15.5	15.5
76	15.5	15.6	15.6
80	15.5	15.6	15.7
84	15.4	15.6	15.8
88	15.4	15.6	15.8
90			

Subtract from table, back cover

Rogation Sunday 6

GMT	♈ GHA	VENUS −4.2 GHA	VENUS −4.2 Dec.	MARS 0.1 GHA	MARS 0.1 Dec.	JUPITER −1.7 GHA	JUPITER −1.7 Dec.	SATURN 0.3 GHA	SATURN 0.3 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
9 0	226 46.9	136 06.1	+27 27.3	268 40.1	−18 02.9	81 52.5	+15 08.2	348 04.6	−18 02.7	201 59.7	93	+13 56.6	+103
1	241 49.3	151 06.8	27.3	283 41.0	02.6	96 54.8	08.1	3 07.3	02.6	216 28.0	92	14 06.9	+101
2	256 51.8	166 07.4	27.2	298 41.9	02.2	111 57.1	08.1	18 09.9	02.6	230 56.2	91	14 17.0	+101
3	271 54.3	181 08.0	·· 27.2	313 42.8	·· 01.8	126 59.5	·· 08.0	33 12.6	·· 02.6	245 24.3	90	·14 27.1	+100
4	286 56.7	196 08.6	27.1	328 43.7	01.4	142 01.8	08.0	48 15.2	02.5	259 52.3	89	14 37.1	+100
5	301 59.2	211 09.2	27.1	343 44.6	01.1	157 04.1	07.9	63 17.9	02.5	274 20.2	88	14 47.1	+ 98
6	317 01.7	226 09.9	+27 27.0	358 45.5	−18 00.7	172 06.4	+15 07.8	78 20.5	−18 02.4	288 48.0	87	+14 56.9	+ 98
7	332 04.1	241 10.5	27.0	13 46.4	18 00.3	187 08.7	07.8	93 23.2	02.4	303 15.7	87	15 06.7	+ 97
8	347 06.6	256 11.1	26.9	28 47.3	17 59.9	202 11.0	07.7	108 25.8	02.4	317 43.4	85	15 16.4	+ 96
9	2 09.1	271 11.7	·· 26.9	43 48.2	·· 59.5	217 13.3	·· 07.7	123 28.5	·· 02.3	332 10.9	85	·15 26.0	+ 96
10	17 11.5	286 12.4	26.8	58 49.1	59.2	232 15.6	07.6	138 31.1	02.3	346 38.4	84	15 35.6	+ 95
11	32 14.0	301 13.0	26.8	73 50.0	58.8	247 17.9	07.6	153 33.8	02.3	1 05.8	82	15 45.1	+ 93
12	47 16.4	316 13.7	+27 26.7	88 50.9	−17 58.4	262 20.2	+15 07.5	168 36.4	−18 02.2	15 33.0	82	+15 54.4	+ 93
13	62 18.9	331 14.3	26.7	103 51.8	58.0	277 22.5	07.4	183 39.1	02.2	30 00.2	81	16 03.7	+ 92
14	77 21.4	346 14.9	26.6	118 52.7	57.7	292 24.8	07.4	198 41.7	02.1	44 27.3	80	16 12.9	+ 92
15	92 23.8	1 15.6	·· 26.6	133 53.6	·· 57.3	307 27.1	·· 07.3	213 44.4	·· 02.1	58 54.3	79	·16 22.1	+ 90
16	107 26.3	16 16.2	26.5	148 54.5	56.9	322 29.4	07.3	228 47.0	02.1	73 21.2	79	16 31.1	+ 89
17	122 28.8	31 16.9	26.4	163 55.4	56.5	337 31.8	07.2	243 49.7	02.0	87 48.1	77	16 40.0	+ 89
18	137 31.2	46 17.5	+27 26.4	178 56.3	−17 56.2	352 34.1	+15 07.2	258 52.3	−18 02.0	102 14.8	76	+16 48.9	+ 87
19	152 33.7	61 18.2	26.3	193 57.2	55.8	7 36.4	07.1	273 55.0	02.0	116 41.4	76	16 57.6	+ 87
20	167 36.2	76 18.8	26.3	208 58.1	55.4	22 38.7	07.0	288 57.6	01.9	131 08.0	74	17 06.3	+ 85
21	182 38.6	91 19.5	·· 26.2	223 59.0	·· 55.0	37 41.0	·· 07.0	304 00.3	·· 01.9	145 34.4	74	·17 14.8	+ 85
22	197 41.1	106 20.2	26.1	238 59.9	54.6	52 43.3	06.9	319 02.9	01.8	160 00.8	73	17 23.3	+ 84
23	212 43.5	121 20.8	26.1	254 00.9	54.3	67 45.6	06.9	334 05.6	01.8	174 27.1	72	17 31.7	+ 82
10 0	227 46.0	136 21.5	+27 26.0	269 01.8	−17 53.9	82 47.9	+15 06.8	349 08.2	−18 01.8	188 53.3	71	+17 39.9	+ 82
1	242 48.5	151 22.2	26.0	284 02.7	53.5	97 50.2	06.7	4 10.9	01.7	203 19.4	70	17 48.1	+ 80
2	257 50.9	166 22.8	25.9	299 03.6	53.1	112 52.5	06.7	19 13.5	01.7	217 45.4	69	17 56.1	+ 79
3	272 53.4	181 23.5	·· 25.8	314 04.5	·· 52.8	127 54.8	·· 06.6	34 16.2	·· 01.7	232 11.3	69	·18 04.0	+ 79
4	287 55.9	196 24.2	25.8	329 05.4	52.4	142 57.1	06.6	49 18.8	01.6	246 37.2	67	18 11.9	+ 77
5	302 58.3	211 24.9	25.7	344 06.3	52.0	157 59.4	06.5	64 21.5	01.6	261 02.9	67	18 19.6	+ 76
6	318 00.8	226 25.5	+27 25.6	359 07.2	−17 51.6	173 01.7	+15 06.4	79 24.1	−18 01.5	275 28.6	66	+18 27.2	+ 75
7	333 03.3	241 26.2	25.5	14 08.1	51.2	188 04.0	06.4	94 26.8	01.5	289 54.2	65	18 34.7	+ 74
8	348 05.7	256 26.9	25.5	29 09.0	50.9	203 06.3	06.3	109 29.4	01.5	304 19.7	64	18 42.1	+ 73
9	3 08.2	271 27.6	·· 25.4	44 09.9	·· 50.5	218 08.6	·· 06.3	124 32.1	·· 01.4	318 45.1	64	·18 49.4	+ 71
10	18 10.7	286 28.3	25.3	59 10.8	50.1	233 10.9	06.2	139 34.7	01.4	333 10.5	62	18 56.5	+ 71
11	33 13.1	301 29.0	25.3	74 11.7	49.7	248 13.2	06.1	154 37.4	01.4	347 35.7	62	19 03.6	+ 69
12	48 15.6	316 29.7	+27 25.2	89 12.6	−17 49.3	263 15.5	+15 06.1	169 40.0	−18 01.3	2 00.9	61	+19 10.5	+ 68
13	63 18.0	331 30.4	25.1	104 13.5	49.0	278 17.8	06.0	184 42.7	01.3	16 26.0	60	19 17.3	+ 67
14	78 20.5	346 31.1	25.0	119 14.4	48.6	293 20.1	06.0	199 45.3	01.2	30 51.0	59	19 24.0	+ 65
15	93 23.0	1 31.8	·· 25.0	134 15.3	·· 48.2	308 22.4	·· 05.9	214 48.0	·· 01.2	45 15.9	59	·19 30.5	+ 64
16	108 25.4	16 32.5	24.9	149 16.3	47.8	323 24.7	05.8	229 50.6	01.2	59 40.8	57	19 36.9	+ 63
17	123 27.9	31 33.2	24.8	164 17.2	47.5	338 27.0	05.8	244 53.3	01.1	74 05.5	57	19 43.2	+ 62
18	138 30.4	46 33.9	+27 24.7	179 18.1	−17 47.1	353 29.3	+15 05.7	259 55.9	−18 01.1	88 30.2	57	+19 49.4	+ 60
19	153 32.8	61 34.6	24.7	194 19.0	46.7	8 31.6	05.7	274 58.6	01.1	102 54.9	55	19 55.4	+ 60
20	168 35.3	76 35.3	24.6	209 19.9	46.3	23 33.9	05.6	290 01.2	01.0	117 19.4	55	20 01.4	+ 57
21	183 37.8	91 36.0	·· 24.5	224 20.8	·· 45.9	38 36.2	·· 05.5	305 03.9	·· 01.0	131 43.9	54	·20 07.1	+ 57
22	198 40.2	106 36.7	24.4	239 21.7	45.6	53 38.5	05.5	320 06.6	00.9	146 08.3	53	20 12.8	+ 55
23	213 42.7	121 37.4	24.4	254 22.6	45.2	68 40.8	05.4	335 09.2	00.9	160 32.6	53	20 18.3	+ 54
11 0	228 45.2	136 38.2	+27 24.3	269 23.5	−17 44.8	83 43.1	+15 05.4	350 11.9	−18 00.9	174 56.9	52	+20 23.7	+ 53
1	243 47.6	151 38.9	24.2	284 24.4	44.4	98 45.4	05.3	5 14.5	00.8	189 21.1	51	20 29.0	+ 51
2	258 50.1	166 39.6	24.1	299 25.3	44.0	113 47.7	05.2	20 17.2	00.8	203 45.2	51	20 34.1	+ 49
3	273 52.5	181 40.3	·· 24.0	314 26.3	·· 43.7	128 50.0	·· 05.2	35 19.8	·· 00.8	218 09.3	50	·20 39.0	+ 49
4	288 55.0	196 41.1	23.9	329 27.2	43.3	143 52.3	05.1	50 22.5	00.7	232 33.3	50	20 43.9	+ 47
5	303 57.5	211 41.8	23.9	344 28.1	42.9	158 54.6	05.0	65 25.1	00.7	246 57.3	48	20 48.6	+ 45
6	318 59.9	226 42.5	+27 23.8	359 29.0	−17 42.5	173 56.9	+15 05.0	80 27.8	−18 00.6	261 21.1	49	+20 53.1	+ 44
7	334 02.4	241 43.3	23.7	14 29.9	42.1	188 59.1	04.9	95 30.4	00.6	275 45.0	47	20 57.5	+ 43
8	349 04.9	256 44.0	23.6	29 30.8	41.7	204 01.4	04.9	110 33.1	00.6	290 08.7	47	21 01.8	+ 41
9	4 07.3	271 44.8	·· 23.5	44 31.7	·· 41.4	219 03.7	·· 04.8	125 35.7	·· 00.5	304 32.4	47	·21 05.9	+ 40
10	19 09.8	286 45.5	23.4	59 32.6	41.0	234 06.0	04.7	140 38.4	00.5	318 56.1	46	21 09.9	+ 38
11	34 12.3	301 46.3	23.3	74 33.6	40.6	249 08.3	04.7	155 41.0	00.5	333 19.7	46	21 13.7	+ 37
12	49 14.7	316 47.0	+27 23.2	89 34.5	−17 40.2	264 10.6	+15 04.6	170 43.7	−18 00.4	347 43.3	45	+21 17.4	+ 36
13	64 17.2	331 47.8	23.2	104 35.4	39.8	279 12.9	04.5	185 46.3	00.4	2 06.8	44	21 21.0	+ 33
14	79 19.6	346 48.5	23.1	119 36.3	39.5	294 15.2	04.5	200 49.0	00.3	16 30.2	44	21 24.3	+ 33
15	94 22.1	1 49.3	·· 23.0	134 37.2	·· 39.1	309 17.5	·· 04.4	215 51.6	·· 00.3	30 53.6	44	·21 27.6	+ 31
16	109 24.6	16 50.0	22.9	149 38.1	38.7	324 19.8	04.4	230 54.3	00.3	45 17.0	43	21 30.7	+ 29
17	124 27.0	31 50.8	22.8	164 39.0	38.3	339 22.1	04.3	245 56.9	00.2	59 40.3	43	21 33.6	+ 28
18	139 29.5	46 51.6	+27 22.7	179 40.0	−17 37.9	354 24.4	+15 04.2	260 59.6	−18 00.2	74 03.6	42	+21 36.4	+ 26
19	154 32.0	61 52.4	22.6	194 40.9	37.5	9 26.7	04.2	276 02.2	00.2	88 26.8	42	21 39.0	+ 25
20	169 34.4	76 53.1	22.5	209 41.8	37.2	24 29.0	04.1	291 04.9	00.1	102 50.0	42	21 41.5	+ 24
21	184 36.9	91 53.9	·· 22.4	224 42.7	·· 36.8	39 31.2	·· 04.0	306 07.5	·· 00.1	117 13.2	41	·21 43.9	+ 21
22	199 39.4	106 54.7	22.3	239 43.6	36.4	54 33.5	04.0	321 10.2	00.0	131 36.3	42	21 46.0	+ 20
23	214 41.8	121 55.5	22.2	254 44.5	36.0	69 35.8	03.9	336 12.9	00.0	145 59.5	40	21 48.0	+ 19
24	229 44.3	136 56.2	+27 22.1	269 45.5	−17 35.6	84 38.1	+15 03.9	351 15.5	−18 00.0	160 22.5	41	+21 49.9	+ 17
code	—	+ 7	− 1	+ 9	+ 3	+ 23	− 1	+ 27	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
9 00	180 54.2	+17 17.5	7	Acamar	315 51.2	−40 28.7
01	195 54.2	18.2	5	Achernar	335 59.1	−57 27.3
02	210 54.2	18.8	30	Acrux	173 56.8	−62 51.8
03	225 54.2	·· 19.5	19	Adhara	255 46.4	−28 55.0
04	240 54.3	20.2	10	Aldebaran	291 38.9	+16 25.3
05	255 54.3	20.9				
06	270 54.3	+17 21.5	32	Alioth	166 57.7	+56 11.8
07	285 54.4	22.2	34	Alkaid	153 32.1	+49 31.8
08	300 54.4	22.9	55	Al Na'ir	28 37.5	−47 10.1
09	315 54.4	·· 23.5	15	Alnilam	276 30.1	− 1 13.8
10	330 54.5	24.2	25	Alphard	218 38.1	− 8 28.4
11	345 54.5	24.8				
12	0 54.5	+17 25.5	41	Alphecca	126 46.9	+26 51.5
13	15 54.5	26.2	1	Alpheratz	358 28.1	+28 50.9
14	30 54.6	26.8	51	Altair	62 49.8	+ 8 45.1
15	45 54.6	·· 27.5	2	Ankaa	353 58.2	−42 32.4
16	60 54.6	28.2	42	Antares	113 18.4	−26 20.2
17	75 54.6	28.8				
18	90 54.7	+17 29.5	37	Arcturus	146 34.4	+19 24.4
19	105 54.7	30.1	43	Atria	108 58.2	−68 56.9
20	120 54.7	30.8	22	Avior	234 35.8	−59 22.5
21	135 54.8	·· 31.5	13	Bellatrix	279 18.2	+ 6 18.6
22	150 54.8	32.1	16	Betelg'se	271 47.9	+ 7 23.9
23	165 54.8	32.8				
			17	Canopus	264 15.6	−52 40.6
10 00	180 54.8	+17 33.4	12	Capella	281 38.2	+45 57.4
01	195 54.9	34.1	53	Deneb	50 00.6	+45 07.2
02	210 54.9	34.7	28	Denebola	183 17.1	+14 48.8
03	225 54.9	·· 35.4	4	Diphda	349 39.1	− 18 13.5
04	240 54.9	36.1				
05	255 54.9	36.7	27	Dubhe	194 43.8	+61 59.3
06	270 55.0	+17 37.4	14	Elnath	279 07.1	+28 34.3
07	285 55.0	38.0	47	Eltanin	91 05.6	+51 29.5
08	300 55.0	38.7	54	Enif	34 29.2	+ 9 40.4
09	315 55.0	·· 39.3	56	Fomalhaut	16 11.3	−29 51.0
10	330 55.1	40.0				
11	345 55.1	40.6	31	Gacrux	172 48.3	−56 52.5
12	0 55.1	+17 41.3	29	Gienah	176 36.2	−17 18.2
13	15 55.1	41.9	35	Hadar	149 48.1	−60 10.0
14	30 55.2	42.6	6	Hamal	328 49.5	+23 15.4
15	45 55.2	·· 43.2	48	Kaus Aust.	84 40.3	−34 24.3
16	60 55.2	43.9				
17	75 55.2	44.5	40	Kochab	137 16.8	+74 20.0
18	90 55.2	+17 45.2	57	Markab	14 21.1	+14 58.2
19	105 55.3	45.8	8	Menkar	315 00.2	+ 3 55.1
20	120 55.3	46.5	36	Menkent	148 57.7	−36 09.6
21	135 55.3	·· 47.1	24	Miapl'dus	221 48.9	−69 32.7
22	150 55.3	47.8				
23	165 55.3	48.4	9	Mirfak	309 42.2	+49 42.4
			50	Nunki	76 51.1	−26 21.1
11 00	180 55.4	+17 49.1	52	Peacock	54 26.4	−56 52.3
01	195 55.4	49.7	21	Pollux	244 20.2	+28 08.0
02	210 55.4	50.4	20	Procyon	245 44.7	+ 5 20.1
03	225 55.4	·· 51.0				
04	240 55.4	51.6	46	R'alhague	96 45.9	+12 35.3
05	255 55.4	52.3	26	Regulus	208 29.0	+12 10.7
06	270 55.5	+17 52.9	11	Rigel	281 53.5	− 8 15.2
07	285 55.5	53.6	38	Rigil Kent.	140 49.7	−60 39.6
08	300 55.5	54.2	44	Sabik	103 01.3	−15 40.4
09	315 55.5	·· 54.8				
10	330 55.5	55.5	3	Schedar	350 29.9	+56 17.8
11	345 55.5	56.1	45	Shaula	97 19.7	−37 04.4
12	0 55.6	+17 56.8	18	Sirius	259 11.7	−16 39.5
13	15 55.6	57.4	33	Spica	159 16.1	− 10 56.2
14	30 55.6	58.0	23	Suhail	223 24.0	−43 15.7
15	45 55.6	·· 58.7				
16	60 55.6	17 59.3	49	Vega	81 07.7	+38 44.4
17	75 55.6	18 00.0	39	Zub'g'bi	137 52.5	−15 51.8
18	90 55.7	+18 00.6				
19	105 55.7	01.2				
20	120 55.7	01.9				
21	135 55.7	·· 02.5				
22	150 55.7	03.1				
23	165 55.7	03.8				
24	180 55.7	+18 04.4				
code	—	+ 6				

Lat.	Sunrise	Twlt. begins	Moonrise 9	10	11	12
N °	h m	h m	h m	h m	h m	h m
72	▭	▭	1 14	0 18	▭	▭
70	1 31	////	1 41	1 22	▭	▭
68	2 14	////	2 02	1 59	1 57	2 01
66	2 42	////	2 19	2 25	2 39	3 12
64	3 03	////	2 32	2 45	3 07	3 48
62	3 20	////	2 44	3 02	3 30	4 14
60	3 34	////	2 54	3 15	3 47	4 35
58	3 46	////	3 02	3 27	4 02	4 52
56	3 57	////	3 10	3 38	4 15	5 06
54	4 06	0 34	3 17	3 47	4 26	5 18
52	4 14	1 23	3 23	3 55	4 36	5 29
50	4 22	1 50	3 28	4 03	4 45	5 39
45	4 37	2 34	3 40	4 18	5 04	5 59
40	4 50	3 03	3 50	4 31	5 19	6 16
35	5 00	3 24	3 59	4 42	5 32	6 30
30	5 10	3 42	4 07	4 52	5 44	6 42
20	5 26	4 08	4 20	5 09	6 04	7 03
10	5 40	4 26	4 32	5 24	6 21	7 21
0	5 53	4 41	4 43	5 38	6 37	7 38
10	6 06	4 53	4 54	5 52	6 53	7 55
20	6 19	5 03	5 06	6 07	7 10	8 13
30	6 35	5 12	5 19	6 24	7 30	8 34
35	6 43	5 16	5 27	6 35	7 42	8 47
40	6 54	5 20	5 36	6 46	7 55	9 01
45	7 05	5 23	5 47	7 00	8 11	9 18
50	7 20	5 26	6 00	7 17	8 31	9 39
52	7 26	5 28	6 06	7 25	8 41	9 49
54	7 34	5 29	6 13	7 34	8 51	10 00
56	7 42	5 30	6 20	7 44	9 03	10 13
58	7 51	5 31	6 29	7 55	9 17	10 27
60	8 02	5 33	6 39	8 08	9 33	10 45
S						

Lat.	Sunset	Twlt. ends	Moonset 9	10	11	12
N °	h m	h m	h m	h m	h m	h m
72	▭	////	22 13	▭	▭	▭
70	22 29	////	21 09	▭	▭	▭
68	21 43	////	20 34	22 37	24 40	0 40
66	21 14	////	20 09	21 55	23 29	24 30
64	20 52	////	19 49	21 27	22 53	23 55
62	20 34	////	19 34	21 06	22 27	23 30
60	20 20	////	19 20	20 48	22 07	23 09
58	20 08	////	19 09	20 34	21 50	22 53
56	19 57	////	18 59	20 21	21 36	22 39
54	19 48	23 33	18 51	20 10	21 24	22 27
52	19 40	22 36	18 43	20 01	21 13	22 16
50	19 32	22 07	18 36	19 52	21 03	22 06
45	19 16	21 21	18 21	19 34	20 43	21 46
40	19 04	20 52	18 09	19 19	20 27	21 29
35	18 53	20 30	17 59	19 07	20 13	21 15
30	18 43	20 12	17 50	18 56	20 01	21 03
20	18 27	19 46	17 35	18 37	19 40	20 43
10	18 13	19 27	17 21	18 21	19 22	20 25
0	18 00	19 12	17 08	18 06	19 06	20 08
10	17 47	19 00	16 56	17 50	18 49	19 51
20	17 33	18 49	16 42	17 34	18 31	19 32
30	17 18	18 40	16 27	17 16	18 10	19 11
35	17 09	18 36	16 18	17 05	17 58	18 59
40	16 59	18 32	16 08	16 52	17 45	18 45
45	16 47	18 28	15 57	16 38	17 28	18 28
50	16 33	18 25	15 42	16 20	17 08	18 07
52	16 26	18 23	15 36	16 12	16 58	17 57
54	16 18	18 22	15 28	16 03	16 48	17 46
56	16 10	18 20	15 20	15 52	16 35	17 34
58	16 01	18 19	15 11	15 40	16 21	17 19
60	15 50	18 18	15 01	15 27	16 05	17 01
S						

GMT	Equation of Time (App −Mean) 9	10	11
h	m s	m s	m s
0	+ 3 36.6	+ 3 39.3	+ 3 41.4
6	+ 3 37.3	+ 3 39.8	+ 3 41.8
12	+ 3 38.0	+ 3 40.4	+ 3 42.2
18	+ 3 38.6	+ 3 40.9	+ 3 42.6
24	+ 3 39.3	+ 3 41.4	+ 3 42.9

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
9	10 56	14 55	6 05	18 30	0 48
10	11 52	14 54	6 04	18 26	0 43
11	12 51	14 53	6 02	18 22	0 39
12	13 53	14 52	6 01	18 19	0 35

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.2	0.3	0.1
30	0.2	0.2	0.1
45	0.2	0.2	0.1
60	0.2	0.1	0.1
75	0.2	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	9	10	11
°	′	′	′
0	18.0	18.7	19.4
4	18.0	18.7	19.4
8	17.9	18.7	19.3
12	17.9	18.7	19.3
16	17.9	18.6	19.2
20	17.8	18.6	19.2
24	17.8	18.5	19.1
28	17.7	18.4	19.0
32	17.6	18.3	18.9
36	17.6	18.2	18.7
40	17.5	18.1	18.6
44	17.4	18.0	18.5
48	17.3	17.8	18.3
52	17.2	17.7	18.1
56	17.1	17.6	18.0
60	17.0	17.4	17.8
64	16.8	17.2	17.6
68	16.7	17.1	17.4
72	16.6	16.9	17.2
76	16.5	16.8	17.0
80	16.3	16.6	16.8
84	16.2	16.4	16.6
88	16.1	16.3	16.4
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	9	10	11
°	′	′	′
0	14.2	13.7	13.4
4	14.2	13.7	13.4
8	14.2	13.8	13.4
12	14.2	13.8	13.5
16	14.3	13.9	13.5
20	14.3	13.9	13.6
24	14.4	14.0	13.7
28	14.4	14.1	13.8
32	14.5	14.2	13.9
36	14.6	14.3	14.0
40	14.7	14.4	14.1
44	14.7	14.5	14.3
48	14.8	14.6	14.4
52	15.0	14.8	14.6
56	15.1	14.9	14.8
60	15.2	15.1	15.0
64	15.3	15.2	15.1
68	15.4	15.4	15.3
72	15.5	15.5	15.5
76	15.7	15.7	15.7
80	15.8	15.9	15.9
84	15.9	16.1	16.2
88	16.0	16.2	16.3
90			

Subtract from table, back cover

Ascension Day 10
New Moon 10

GMT	♈ GHA	VENUS −4.2 GHA	VENUS −4.2 Dec.	MARS 0.1 GHA	MARS 0.1 Dec.	JUPITER −1.6 GHA	JUPITER −1.6 Dec.	SATURN 0.3 GHA	SATURN 0.3 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
12 0	229 44.3	136 56.2	+27 22.1	269 45.5	−17 35.6	84 38.1	+15 03.9	351 15.5	−18 00.0	160 22.5	41	+21 49.9	+ 17
1	244 46.8	151 57.0	22.0	284 46.4	35.3	99 40.4	03.8	6 18.2	17 59.9	174 45.6	40	21 51.6	+ 16
2	259 49.2	166 57.8	21.9	299 47.3	34.9	114 42.7	03.7	21 20.8	59.9	189 08.6	40	21 53.2	+ 14
3	274 51.7	181 58.6	·· 21.8	314 48.2	·· 34.5	129 45.0	·· 03.7	36 23.5	·· 59.9	203 31.6	40	·21 54.6	+ 12
4	289 54.1	196 59.4	21.7	329 49.1	34.1	144 47.3	03.6	51 26.1	59.8	217 54.6	39	21 55.8	+ 11
5	304 56.6	212 00.2	21.6	344 50.0	33.7	159 49.6	03.5	66 28.8	59.8	232 17.5	40	21 56.9	+ 9
6	319 59.1	227 01.0	+27 21.5	359 51.0	−17 33.3	174 51.8	+15 03.5	81 31.4	−17 59.7	246 40.5	39	+21 57.8	+ 8
7	335 01.5	242 01.8	21.4	14 51.9	33.0	189 54.1	03.4	96 34.1	59.7	261 03.4	39	21 58.6	+ 6
8	350 04.0	257 02.6	21.3	29 52.8	32.6	204 56.4	03.3	111 36.7	59.7	275 26.3	39	21 59.2	+ 5
9	5 06.5	272 03.4	·· 21.2	44 53.7	·· 32.2	219 58.7	·· 03.3	126 39.4	·· 59.6	289 49.2	39	·21 59.7	+ 3
10	20 08.9	287 04.2	21.1	59 54.6	31.8	235 01.0	03.2	141 42.0	59.6	304 12.1	39	22 00.0	+ 1
11	35 11.4	302 05.0	21.0	74 55.6	31.4	250 03.3	03.1	156 44.7	59.5	318 35.0	39	22 00.1	0
12	50 13.9	317 05.8	+27 20.9	89 56.5	−17 31.0	265 05.6	+15 03.1	171 47.3	−17 59.5	332 57.9	39	+22 00.1	− 2
13	65 16.3	332 06.6	20.8	104 57.4	30.7	280 07.9	03.0	186 50.0	59.5	347 20.8	38	21 59.9	− 3
14	80 18.8	347 07.4	20.7	119 58.3	30.3	295 10.1	03.0	201 52.6	59.4	1 43.6	39	21 59.6	− 5
15	95 21.3	2 08.3	·· 20.6	134 59.2	·· 29.9	310 12.4	·· 02.9	216 55.3	·· 59.4	16 06.5	39	·21 59.1	− 7
16	110 23.7	17 09.1	20.4	150 00.2	29.5	325 14.7	02.8	231 57.9	59.4	30 29.4	39	21 58.4	− 8
17	125 26.2	32 09.9	20.3	165 01.1	29.1	340 17.0	02.8	247 00.6	59.3	44 52.3	39	21 57.6	− 10
18	140 28.6	47 10.7	+27 20.2	180 02.0	−17 28.7	355 19.3	+15 02.7	262 03.3	−17 59.3	59 15.2	39	+21 56.6	− 11
19	155 31.1	62 11.6	20.1	195 02.9	28.3	10 21.6	02.6	277 05.9	59.2	73 38.1	39	21 55.5	− 13
20	170 33.6	77 12.4	20.0	210 03.9	28.0	25 23.9	02.6	292 08.6	59.2	88 01.0	39	21 54.2	− 14
21	185 36.0	92 13.2	·· 19.9	225 04.8	·· 27.6	40 26.1	·· 02.5	307 11.2	·· 59.2	102 23.9	39	·21 52.8	− 17
22	200 38.5	107 14.1	19.8	240 05.7	27.2	55 28.4	02.4	322 13.9	59.1	116 46.8	40	21 51.1	− 17
23	215 41.0	122 14.9	19.7	255 06.6	26.8	70 30.7	02.4	337 16.5	59.1	131 09.8	39	21 49.4	− 19
13 0	230 43.4	137 15.8	+27 19.5	270 07.5	−17 26.4	85 33.0	+15 02.3	352 19.2	−17 59.1	145 32.7	40	+21 47.5	− 21
1	245 45.9	152 16.6	19.4	285 08.5	26.0	100 35.3	02.2	7 21.8	59.0	159 55.7	40	21 45.4	− 22
2	260 48.4	167 17.4	19.3	300 09.4	25.7	115 37.6	02.2	22 24.5	59.0	174 18.7	41	21 43.2	− 24
3	275 50.8	182 18.3	·· 19.2	315 10.3	·· 25.3	130 39.8	·· 02.1	37 27.1	·· 58.9	188 41.8	40	·21 40.8	− 26
4	290 53.3	197 19.2	19.1	330 11.2	24.9	145 42.1	02.0	52 29.8	58.9	203 04.8	41	21 38.2	− 26
5	305 55.8	212 20.0	19.0	345 12.2	24.5	160 44.4	02.0	67 32.4	58.9	217 27.9	41	21 35.6	− 29
6	320 58.2	227 20.9	+27 18.8	0 13.1	−17 24.1	175 46.7	+15 01.9	82 35.1	−17 58.8	231 51.0	42	+21 32.7	− 30
7	336 00.7	242 21.7	18.7	15 14.0	23.7	190 49.0	01.8	97 37.7	58.8	246 14.2	42	21 29.7	− 32
8	351 03.1	257 22.6	18.6	30 14.9	23.3	205 51.3	01.8	112 40.4	58.8	260 37.4	42	21 26.5	− 33
9	6 05.6	272 23.5	·· 18.5	45 15.9	·· 23.0	220 53.5	·· 01.7	127 43.1	·· 58.7	275 00.6	43	·21 23.2	− 34
10	21 08.1	287 24.3	18.4	60 16.8	22.6	235 55.8	01.6	142 45.7	58.7	289 23.9	43	21 19.8	− 36
11	36 10.5	302 25.2	18.2	75 17.7	22.2	250 58.1	01.6	157 48.4	58.6	303 47.2	43	21 16.2	− 38
12	51 13.0	317 26.1	+27 18.1	90 18.7	−17 21.8	266 00.4	+15 01.5	172 51.0	−17 58.6	318 10.5	44	+21 12.4	− 39
13	66 15.5	332 26.9	18.0	105 19.6	21.4	281 02.7	01.4	187 53.7	58.6	332 33.9	44	21 08.5	− 40
14	81 17.9	347 27.8	17.9	120 20.5	21.0	296 04.9	01.4	202 56.3	58.5	346 57.3	45	21 04.5	− 42
15	96 20.4	2 28.7	·· 17.7	135 21.4	·· 20.6	311 07.2	·· 01.3	217 59.0	·· 58.5	1 20.8	45	·21 00.3	− 44
16	111 22.9	17 29.6	17.6	150 22.4	20.3	326 09.5	01.2	233 01.6	58.5	15 44.3	45	20 55.9	− 45
17	126 25.3	32 30.5	17.5	165 23.3	19.9	341 11.8	01.2	248 04.3	58.4	30 07.8	46	20 51.4	− 46
18	141 27.8	47 31.4	+27 17.4	180 24.2	−17 19.5	356 14.0	+15 01.1	263 06.9	−17 58.4	44 31.4	47	+20 46.8	− 48
19	156 30.2	62 32.3	17.2	195 25.1	19.1	11 16.3	01.0	278 09.6	58.3	58 55.1	47	20 42.0	− 50
20	171 32.7	77 33.2	17.1	210 26.1	18.7	26 18.6	01.0	293 12.2	58.3	73 18.8	48	20 37.0	− 50
21	186 35.2	92 34.1	·· 17.0	225 27.0	·· 18.3	41 20.9	·· 00.9	308 14.9	·· 58.3	87 42.6	48	·20 32.0	− 52
22	201 37.6	107 35.0	16.9	240 27.9	17.9	56 23.2	00.8	323 17.5	58.2	102 06.4	49	20 26.8	− 54
23	216 40.1	122 35.9	16.7	255 28.9	17.6	71 25.4	00.8	338 20.2	58.2	116 30.3	49	20 21.4	− 55
14 0	231 42.6	137 36.8	+27 16.6	270 29.8	−17 17.2	86 27.7	+15 00.7	353 22.9	−17 58.2	130 54.2	50	+20 15.9	− 56
1	246 45.0	152 37.7	16.5	285 30.7	16.8	101 30.0	00.6	8 25.5	58.1	145 18.2	51	20 10.3	− 58
2	261 47.5	167 38.6	16.3	300 31.7	16.4	116 32.3	00.6	23 28.2	58.1	159 42.3	51	20 04.5	− 59
3	276 50.0	182 39.5	·· 16.2	315 32.6	·· 16.0	131 34.5	·· 00.5	38 30.8	·· 58.0	174 06.4	52	·19 58.6	− 60
4	291 52.4	197 40.4	16.1	330 33.5	15.6	146 36.8	00.4	53 33.5	58.0	188 30.6	52	19 52.6	− 62
5	306 54.9	212 41.4	15.9	345 34.5	15.2	161 39.1	00.3	68 36.1	58.0	202 54.8	53	19 46.4	− 63
6	321 57.4	227 42.3	+27 15.8	0 35.4	−17 14.8	176 41.4	+15 00.3	83 38.8	−17 57.9	217 19.1	54	+19 40.1	− 65
7	336 59.8	242 43.2	15.7	15 36.3	14.5	191 43.6	00.2	98 41.4	57.9	231 43.5	54	19 33.6	− 65
8	352 02.3	257 44.1	15.5	30 37.3	14.1	206 45.9	00.1	113 44.1	57.9	246 07.9	56	19 27.1	− 67
9	7 04.7	272 45.1	·· 15.4	45 38.2	·· 13.7	221 48.2	·· 00.1	128 46.7	·· 57.8	260 32.5	55	·19 20.4	− 68
10	22 07.2	287 46.0	15.2	60 39.1	13.3	236 50.5	15 00.0	143 49.4	57.8	274 57.0	57	19 13.6	− 70
11	37 09.7	302 46.9	15.1	75 40.1	12.9	251 52.7	14 59.9	158 52.0	57.7	289 21.7	57	19 06.6	− 71
12	52 12.1	317 47.9	+27 15.0	90 41.0	−17 12.5	266 55.0	+14 59.9	173 54.7	−17 57.7	303 46.4	58	+18 59.5	− 72
13	67 14.6	332 48.8	14.8	105 41.9	12.1	281 57.3	59.8	188 57.4	57.7	318 11.2	59	18 52.3	− 73
14	82 17.1	347 49.8	14.7	120 42.9	11.7	296 59.6	59.7	204 00.0	57.6	332 36.1	59	18 45.0	− 74
15	97 19.5	2 50.7	·· 14.5	135 43.8	·· 11.4	312 01.8	·· 59.7	219 02.7	·· 57.6	347 01.0	60	·18 37.6	− 76
16	112 22.0	17 51.7	14.4	150 44.7	11.0	327 04.1	59.6	234 05.3	57.5	1 26.0	61	18 30.0	− 77
17	127 24.5	32 52.6	14.3	165 45.7	10.6	342 06.4	59.5	249 08.0	57.5	15 51.1	61	18 22.3	− 78
18	142 26.9	47 53.6	+27 14.1	180 46.6	−17 10.2	357 08.7	+14 59.4	264 10.6	−17 57.5	30 16.2	63	+18 14.5	− 79
19	157 29.4	62 54.6	14.0	195 47.5	09.8	12 10.9	59.4	279 13.3	57.4	44 41.5	63	18 06.6	− 81
20	172 31.9	77 55.5	13.8	210 48.5	09.4	27 13.2	59.3	294 15.9	57.4	59 06.8	64	17 58.5	− 81
21	187 34.3	92 56.5	·· 13.7	225 49.4	·· 09.0	42 15.5	·· 59.2	309 18.6	·· 57.4	73 32.2	64	·17 50.4	− 83
22	202 36.8	107 57.4	13.5	240 50.3	08.6	57 17.7	59.2	324 21.2	57.3	87 57.6	65	17 42.1	− 83
23	217 39.2	122 58.4	13.4	255 51.3	08.2	72 20.0	59.1	339 23.9	57.3	102 23.1	67	17 33.8	− 85
24	232 41.7	137 59.4	+27 13.3	270 52.2	−17 07.9	87 22.3	+14 59.0	354 26.6	−17 57.2	116 48.8	67	+17 25.3	− 86
code	—	+ 8	− 1	+ 9	+ 4	+ 23	− 1	+ 27	0				

GMT Day	h	SUN GHA °	GHA ′	Dec. °	Dec. ′
12	0	180	55.7	+18	04.4
	1	195	55.8		05.0
	2	210	55.8		05.7
	3	225	55.8	··	06.3
	4	240	55.8		06.9
	5	255	55.8		07.5
	6	270	55.8	+18	08.2
	7	285	55.8		08.8
	8	300	55.8		09.4
	9	315	55.8	··	10.1
	10	330	55.9		10.7
	11	345	55.9		11.3
	12	0	55.9	+18	11.9
	13	15	55.9		12.6
	14	30	55.9		13.2
	15	45	55.9	··	13.8
	16	60	55.9		14.4
	17	75	55.9		15.1
	18	90	55.9	+18	15.7
	19	105	55.9		16.3
	20	120	56.0		16.9
	21	135	56.0	··	17.6
	22	150	56.0		18.2
	23	165	56.0		18.8
13	0	180	56.0	+18	19.4
	1	195	56.0		20.0
	2	210	56.0		20.7
	3	225	56.0	··	21.3
	4	240	56.0		21.9
	5	255	56.0		22.5
	6	270	56.0	+18	23.1
	7	285	56.0		23.7
	8	300	56.0		24.4
	9	315	56.0	··	25.0
	10	330	56.0		25.6
	11	345	56.0		26.2
	12	0	56.1	+18	26.8
	13	15	56.1		27.4
	14	30	56.1		28.0
	15	45	56.1	··	28.7
	16	60	56.1		29.3
	17	75	56.1		29.9
	18	90	56.1	+18	30.5
	19	105	56.1		31.1
	20	120	56.1		31.7
	21	135	56.1	··	32.3
	22	150	56.1		32.9
	23	165	56.1		33.5
14	0	180	56.1	+18	34.1
	1	195	56.1		34.7
	2	210	56.1		35.4
	3	225	56.1	··	36.0
	4	240	56.1		36.6
	5	255	56.1		37.2
	6	270	56.1	+18	37.8
	7	285	56.1		38.4
	8	300	56.1		39.0
	9	315	56.1	··	39.6
	10	330	56.1		40.2
	11	345	56.1		40.8
	12	0	56.1	+18	41.4
	13	15	56.1		42.0
	14	30	56.1		42.6
	15	45	56.1	··	43.2
	16	60	56.1		43.8
	17	75	56.1		44.4
	18	90	56.1	+18	45.0
	19	105	56.1		45.6
	20	120	56.1		46.2
	21	135	56.1	··	46.8
	22	150	56.1		47.4
	23	165	56.1		47.9
	24	180	56.0	+18	48.5
code			—		+ 6

No.	STARS Name	SHA °	SHA ′	Dec. °	Dec. ′
7	Acamar	315	51.2	−40	28.7
5	Achernar	335	59.1	−57	27.3
30	Acrux	173	56.8	−62	51.8
19	Adhara	255	46.4	−28	55.0
10	Aldebaran	291	38.9	+16	25.3
32	Alioth	166	57.7	+56	11.8
34	Alkaid	153	32.1	+49	31.8
55	Al Na'ir	28	37.4	−47	10.1
15	Alnilam	276	30.1	− 1	13.8
25	Alphard	218	38.2	− 8	28.4
41	Alphecca	126	46.9	+26	51.6
1	Alpheratz	358	28.1	+28	50.9
51	Altair	62	49.8	+ 8	45.1
2	Ankaa	353	58.1	−42	32.4
42	Antares	113	18.4	−26	20.2
37	Arcturus	146	34.4	+19	24.4
43	Atria	108	58.2	−68	57.0
22	Avior	234	35.8	−59	22.5
13	Bellatrix	279	18.2	+ 6	18.6
16	Betelg'se	271	47.9	+ 7	23.9
17	Canopus	264	15.6	−52	40.5
12	Capella	281	38.2	+45	57.4
53	Deneb	50	00.5	+45	07.2
28	Denebola	183	17.1	+14	48.9
4	Diphda	349	39.0	−18	13.5
27	Dubhe	194	43.8	+61	59.3
14	Elnath	279	07.1	+28	34.3
47	Eltanin	91	05.6	+51	29.5
54	Enif	34	29.1	+ 9	40.4
56	Fomalhaut	16	11.2	−29	51.0
31	Gacrux	172	48.3	−56	52.5
29	Gienah	176	36.2	−17	18.2
35	Hadar	149	48.1	−60	10.0
6	Hamal	328	49.4	+23	15.4
48	Kaus Aust.	84	40.3	−34	24.3
40	Kochab	137	16.8	+74	20.0
57	Markab	14	21.1	+14	58.2
8	Menkar	315	00.2	+ 3	55.1
36	Menkent	148	57.7	−36	09.6
24	Miapl'dus	221	49.0	−69	32.7
9	Mirfak	309	42.2	+49	42.4
50	Nunki	76	51.1	−26	21.1
52	Peacock	54	26.4	−56	52.3
21	Pollux	244	20.2	+28	08.0
20	Procyon	245	44.7	+ 5	20.1
46	R'alhague	96	45.9	+12	35.4
26	Regulus	208	29.0	+12	10.8
11	Rigel	281	53.5	− 8	15.2
38	Rigil Kent.	140	49.7	−60	39.6
44	Sabik	103	01.3	−15	40.4
3	Schedar	350	29.8	+56	17.8
45	Shaula	97	19.7	−37	04.4
18	Sirius	259	11.7	−16	39.5
33	Spica	159	16.1	−10	56.2
23	Suhail	223	24.0	−43	15.7
49	Vega	81	07.6	+38	44.4
39	Zub'g'bi	137	52.5	−15	51.8

Lat. °	Sunrise h m	Twlt. begins h m	Moonrise 12 h m	Moonrise 13 h m	Moonrise 14 h m	Moonrise 15 h m
N 72	▭	▭	▭	▭	▭	6 08
70	1 04	////	▭	▭	4 07	6 56
68	1 58	////	2 01	3 17	5 23	7 26
66	2 30	////	3 12	4 21	6 00	7 49
64	2 53	////	3 48	4 56	6 26	8 07
62	3 12	////	4 14	5 21	6 47	8 21
60	3 27	////	4 35	5 41	7 03	8 33
58	3 40	////	4 52	5 58	7 17	8 44
56	3 51	////	5 06	6 11	7 29	8 53
54	4 01	////	5 18	6 24	7 39	9 01
52	4 09	1 08	5 29	6 34	7 49	9 08
50	4 17	1 40	5 39	6 44	7 57	9 15
45	4 33	2 28	5 59	7 04	8 15	9 29
40	4 47	2 59	6 16	7 20	8 29	9 40
35	4 58	3 21	6 30	7 33	8 41	9 50
30	5 08	3 39	6 42	7 45	8 52	9 58
20	5 25	4 05	7 03	8 06	9 10	10 13
10	5 39	4 24	7 21	8 23	9 25	10 26
0	5 53	4 40	7 38	8 40	9 40	10 37
10	6 06	4 53	7 55	8 56	9 55	10 49
20	6 20	5 04	8 13	9 14	10 11	11 02
30	6 36	5 14	8 34	9 34	10 28	11 16
35	6 46	5 18	8 47	9 46	10 39	11 25
40	6 56	5 22	9 01	10 00	10 51	11 34
45	7 09	5 26	9 18	10 16	11 05	11 45
50	7 24	5 30	9 39	10 36	11 22	11 59
52	7 31	5 32	9 49	10 45	11 30	12 05
54	7 39	5 33	10 00	10 56	11 39	12 12
56	7 47	5 35	10 13	11 08	11 49	12 19
58	7 57	5 37	10 27	11 22	12 00	12 28
60 S	8 08	5 38	10 45	11 38	12 13	12 38

Lat. °	Sunset h m	Twlt. ends h m	Moonset 12 h m	Moonset 13 h m	Moonset 14 h m	Moonset 15 h m
N 72	▭	▭	▭	▭	▭	2 55
70	22 59	////	▭	▭	2 52	2 05
68	21 59	////	0 40	1 35	1 36	1 34
66	21 26	////	24 30	0 30	0 58	1 10
64	21 02	////	23 55	24 31	0 31	0 52
62	20 43	////	23 30	24 10	0 10	0 36
60	20 27	////	23 09	23 53	24 23	0 23
58	20 14	////	22 53	23 39	24 12	0 12
56	20 03	////	22 39	23 27	24 02	0 02
54	19 53	////	22 27	23 16	23 54	24 23
52	19 44	22 51	22 16	23 06	23 46	24 17
50	19 37	22 17	22 06	22 58	23 39	24 12
45	19 20	21 28	21 46	22 39	23 24	24 01
40	19 06	20 56	21 29	22 24	23 11	23 52
35	18 55	20 33	21 15	22 12	23 01	23 44
30	18 45	20 15	21 03	22 00	22 52	23 37
20	18 28	19 48	20 43	21 41	22 35	23 25
10	18 13	19 28	20 25	21 25	22 21	23 14
0	18 00	19 13	20 08	21 09	22 08	23 04
10	17 46	18 59	19 51	20 53	21 54	22 53
20	17 32	18 48	19 32	20 36	21 40	22 42
30	17 16	18 39	19 11	20 16	21 23	22 30
35	17 07	18 34	18 59	20 05	21 14	22 22
40	16 56	18 30	18 45	19 52	21 02	22 14
45	16 43	18 25	18 28	19 36	20 49	22 04
50	16 28	18 21	18 07	19 17	20 33	21 52
52	16 21	18 19	17 57	19 08	20 26	21 46
54	16 13	18 17	17 46	18 57	20 17	21 40
56	16 05	18 17	17 34	18 46	20 08	21 33
58	15 55	18 15	17 19	18 32	19 57	21 25
60 S	15 43	18 12	17 01	18 17	19 44	21 16

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0			
	0.2	0.3	0.1
30			
	0.2	0.2	0.1
45			
	0.2	0.2	0.1
60			
	0.2	0.1	0.1
75			
	0.2	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt. °	12 ′	13 ′	14 ′
0			
	19.6	19.6	19.4
4			
	19.6	19.6	19.4
8			
	19.6	19.6	19.3
12			
	19.5	19.5	19.3
16			
	19.5	19.5	19.2
20			
	19.4	19.4	19.2
24			
	19.3	19.3	19.1
28			
	19.2	19.2	19.0
32			
	19.1	19.1	18.9
36			
	18.9	18.9	18.7
40			
	18.8	18.8	18.6
44			
	18.6	18.6	18.5
48			
	18.5	18.5	18.3
52			
	18.3	18.3	18.1
56			
	18.1	18.1	18.0
60			
	17.9	17.9	17.8
64			
	17.7	17.7	17.6
68			
	17.5	17.5	17.4
72			
	17.3	17.3	17.2
76			
	17.1	17.1	17.0
80			
	16.9	16.9	16.8
84			
	16.6	16.6	16.6
88			
	16.5	16.5	16.4
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt. °	12 ′	13 ′	14 ′
0			
	13.2	13.2	13.4
4			
	13.2	13.2	13.4
8			
	13.3	13.3	13.4
12			
	13.3	13.3	13.5
16			
	13.4	13.4	13.5
20			
	13.5	13.5	13.6
24			
	13.5	13.5	13.7
28			
	13.6	13.6	13.8
32			
	13.8	13.8	13.9
36			
	13.9	13.9	14.0
40			
	14.0	14.0	14.1
44			
	14.2	14.2	14.3
48			
	14.4	14.4	14.4
52			
	14.5	14.5	14.6
56			
	14.7	14.7	14.8
60			
	14.9	14.9	15.0
64			
	15.1	15.1	15.1
68			
	15.3	15.3	15.3
72			
	15.5	15.5	15.5
76			
	15.8	15.8	15.7
80			
	16.0	16.0	15.9
84			
	16.2	16.2	16.2
88			
	16.4	16.4	16.3
90			

Subtract from table, back cover

Equation of Time (App. -Mean)

GMT h	12 m s	13 m s	14 m s
0	+ 3 42.9	+ 3 43.9	+ 3 44.3
6	+ 3 43.2	+ 3 44.1	+ 3 44.4
12	+ 3 43.5	+ 3 44.2	+ 3 44.3
18	+ 3 43.7	+ 3 44.3	+ 3 44.3
24	+ 3 43.9	+ 3 44.3	+ 3 44.2

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
12	13 53	14 52	6 01	18 19	0 35
13	14 54	14 50	5 59	18 15	0 31
14	15 54	14 49	5 58	18 11	0 26
15	16 51	14 47	5 56	18 08	0 22

GMT	♈ GHA	VENUS −4.2 GHA	Dec.	MARS 0.0 GHA	Dec.	JUPITER −1.6 GHA	Dec.	SATURN 0.2 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
15 0	232 41.7	137 59.4	+27 13.3	270 52.2	−17 07.9	87 22.3	+14 59.0	354 26.6	−17 57.2	116 48.8	67	+17 25.3	− 86
1	247 44.2	153 00.4	13.1	285 53.2	07.5	102 24.6	59.0	9 29.2	57.2	131 14.5	67	17 16.7	− 87
2	262 46.6	168 01.4	13.0	300 54.1	07.1	117 26.8	58.9	24 31.9	57.2	145 40.2	69	17 08.0	− 88
3	277 49.1	183 02.3	·· 12.8	315 55.0	·· 06.7	132 29.1	·· 58.8	39 34.5	·· 57.1	160 06.1	69	·16 59.2	− 89
4	292 51.6	198 03.3	12.7	330 56.0	06.3	147 31.4	58.7	54 37.2	57.1	174 32.0	70	16 50.3	− 90
5	307 54.0	213 04.3	12.5	345 56.9	05.9	162 33.6	58.7	69 39.8	57.1	188 58.0	71	16 41.3	− 91
6	322 56.5	228 05.3	+27 12.4	0 57.8	−17 05.5	177 35.9	+14 58.6	84 42.5	−17 57.0	203 24.1	72	+16 32.2	− 92
7	337 59.0	243 06.3	12.2	15 58.8	05.1	192 38.2	58.5	99 45.1	57.0	217 50.3	72	16 23.0	− 93
8	353 01.4	258 07.3	12.1	30 59.7	04.7	207 40.4	58.5	114 47.8	56.9	232 16.5	73	16 13.7	− 94
9	8 03.9	273 08.3	·· 11.9	46 00.7	·· 04.4	222 42.7	·· 58.4	129 50.4	·· 56.9	246 42.8	74	·16 04.3	− 95
10	23 06.3	288 09.3	11.7	61 01.6	04.0	237 45.0	58.3	144 53.1	56.9	261 09.2	75	15 54.8	− 96
11	38 08.8	303 10.3	11.6	76 02.5	03.6	252 47.2	58.3	159 55.8	56.8	275 35.7	76	15 45.2	− 97
12	53 11.3	318 11.3	+27 11.4	91 03.5	−17 03.2	267 49.5	+14 58.2	174 58.4	−17 56.8	290 02.3	76	+15 35.5	− 97
13	68 13.7	333 12.3	11.3	106 04.4	02.8	282 51.8	58.1	190 01.1	56.8	304 28.9	77	15 25.8	− 99
14	83 16.2	348 13.3	11.1	121 05.4	02.4	297 54.0	58.0	205 03.7	56.7	318 55.6	78	15 15.9	− 99
15	98 18.7	3 14.4	·· 11.0	136 06.3	·· 02.0	312 56.3	·· 58.0	220 06.4	·· 56.7	333 22.4	79	·15 06.0	−101
16	113 21.1	18 15.4	10.8	151 07.2	01.6	327 58.6	57.9	235 09.0	56.6	347 49.3	80	14 55.9	−101
17	128 23.6	33 16.4	10.7	166 08.2	01.2	343 00.8	57.8	250 11.7	56.6	2 16.3	80	14 45.8	−102
18	143 26.1	48 17.4	+27 10.5	181 09.1	−17 00.8	358 03.1	+14 57.7	265 14.3	−17 56.6	16 43.3	81	+14 35.6	−103
19	158 28.5	63 18.5	10.3	196 10.1	00.5	13 05.4	57.7	280 17.0	56.5	31 10.4	82	14 25.3	−103
20	173 31.0	78 19.5	10.2	211 11.0	17 00.1	28 07.6	57.6	295 19.7	56.5	45 37.6	83	14 15.0	−105
21	188 33.5	93 20.5	·· 10.0	226 12.0	·16 59.7	43 09.9	·· 57.5	310 22.3	·· 56.5	60 04.9	83	·14 04.5	−105
22	203 35.9	108 21.6	09.9	241 12.9	59.3	58 12.2	57.5	325 25.0	56.4	74 32.2	84	13 54.0	−106
23	218 38.4	123 22.6	09.7	256 13.8	58.9	73 14.4	57.4	340 27.6	56.4	88 59.6	85	13 43.4	−107
16 0	233 40.8	138 23.6	+27 09.5	271 14.8	−16 58.5	88 16.7	+14 57.3	355 30.3	−17 56.3	103 27.1	86	+13 32.7	−107
1	248 43.3	153 24.7	09.4	286 15.7	58.1	103 19.0	57.2	10 32.9	56.3	117 54.7	87	13 22.0	−108
2	263 45.8	168 25.7	09.2	301 16.7	57.7	118 21.2	57.2	25 35.6	56.3	132 22.4	87	13 11.2	−109
3	278 48.2	183 26.8	·· 09.0	316 17.6	·· 57.3	133 23.5	·· 57.1	40 38.2	·· 56.2	146 50.1	88	·13 00.3	−110
4	293 50.7	198 27.9	08.9	331 18.6	56.9	148 25.7	57.0	55 40.9	56.2	161 17.9	89	12 49.3	−110
5	308 53.2	213 28.9	08.7	346 19.5	56.5	163 28.0	57.0	70 43.5	56.2	175 45.8	90	12 38.3	−111
6	323 55.6	228 30.0	+27 08.6	1 20.5	−16 56.2	178 30.3	+14 56.9	85 46.2	−17 56.1	190 13.8	90	+12 27.2	−112
7	338 58.1	243 31.0	08.4	16 21.4	55.8	193 32.5	56.8	100 48.9	56.1	204 41.8	91	12 16.0	−112
8	354 00.6	258 32.1	08.2	31 22.4	55.4	208 34.8	56.7	115 51.5	56.0	219 09.9	92	12 04.8	−113
9	9 03.0	273 33.2	·· 08.1	46 23.3	·· 55.0	223 37.1	·· 56.7	130 54.2	·· 56.0	233 38.1	92	·11 53.5	−113
10	24 05.5	288 34.2	07.9	61 24.2	54.6	238 39.3	56.6	145 56.8	56.0	248 06.3	93	11 42.2	−114
11	39 08.0	303 35.3	07.7	76 25.2	54.2	253 41.6	56.5	160 59.5	55.9	262 34.6	94	11 30.8	−115
12	54 10.4	318 36.4	+27 07.5	91 26.1	−16 53.8	268 43.8	+14 56.4	176 02.1	−17 55.9	277 03.0	95	+11 19.3	−115
13	69 12.9	333 37.5	07.4	106 27.1	53.4	283 46.1	56.4	191 04.8	55.9	291 31.5	95	11 07.8	−116
14	84 15.3	348 38.6	07.2	121 28.0	53.0	298 48.4	56.3	206 07.4	55.8	306 00.0	96	10 56.2	−116
15	99 17.8	3 39.7	·· 07.0	136 29.0	·· 52.6	313 50.6	·· 56.2	221 10.1	·· 55.8	320 28.6	97	·10 44.6	−117
16	114 20.3	18 40.8	06.9	151 29.9	52.2	328 52.9	56.1	236 12.8	55.7	334 57.3	97	10 32.9	−117
17	129 22.7	33 41.9	06.7	166 30.9	51.8	343 55.1	56.1	251 15.4	55.7	349 26.0	98	10 21.2	−118
18	144 25.2	48 43.0	+27 06.5	181 31.8	−16 51.5	358 57.4	+14 56.0	266 18.1	−17 55.7	3 54.8	99	+10 09.4	−118
19	159 27.7	63 44.1	06.3	196 32.8	51.1	13 59.7	55.9	281 20.7	55.6	18 23.7	99	9 57.6	−119
20	174 30.1	78 45.2	06.2	211 33.7	50.7	29 01.9	55.8	296 23.4	55.6	32 52.6	100	9 45.7	−119
21	189 32.6	93 46.3	·· 06.0	226 34.7	·· 50.3	44 04.2	·· 55.8	311 26.0	·· 55.5	47 21.6	101	· 9 33.8	−120
22	204 35.1	108 47.4	05.8	241 35.6	49.9	59 06.4	55.7	326 28.7	55.5	61 50.7	101	9 21.8	−120
23	219 37.5	123 48.5	05.6	256 36.6	49.5	74 08.7	55.6	341 31.3	55.5	76 19.8	102	9 09.8	−120
17 0	234 40.0	138 49.6	+27 05.5	271 37.5	−16 49.1	89 11.0	+14 55.5	356 34.0	−17 55.4	90 49.0	103	+ 8 57.8	−121
1	249 42.4	153 50.7	05.3	286 38.5	48.7	104 13.2	55.5	11 36.6	55.4	105 18.3	103	8 45.7	−121
2	264 44.9	168 51.8	05.1	301 39.4	48.3	119 15.5	55.4	26 39.3	55.4	119 47.6	104	8 33.6	−122
3	279 47.4	183 53.0	·· 04.9	316 40.4	·· 47.9	134 17.7	·· 55.3	41 42.0	·· 55.3	134 17.0	104	· 8 21.4	−122
4	294 49.8	198 54.1	04.7	331 41.3	47.5	149 20.0	55.3	56 44.6	55.3	148 46.4	105	8 09.2	−122
5	309 52.3	213 55.2	04.6	346 42.3	47.1	164 22.2	55.2	71 47.3	55.2	163 15.9	105	7 57.0	−123
6	324 54.8	228 56.4	+27 04.4	1 43.2	−16 46.7	179 24.5	+14 55.1	86 49.9	−17 55.2	177 45.4	107	+ 7 44.7	−123
7	339 57.2	243 57.5	04.2	16 44.2	46.4	194 26.7	55.0	101 52.6	55.2	192 15.1	106	7 32.4	−123
8	354 59.7	258 58.6	04.0	31 45.1	46.0	209 29.0	55.0	116 55.2	55.1	206 44.7	107	7 20.1	−124
9	10 02.2	273 59.8	·· 03.8	46 46.1	·· 45.6	224 31.3	·· 54.9	131 57.9	·· 55.1	221 14.4	108	· 7 07.7	−124
10	25 04.6	289 00.9	03.7	61 47.1	45.2	239 33.5	54.8	147 00.5	55.1	235 44.2	108	6 55.3	−124
11	40 07.1	304 02.1	03.5	76 48.0	44.8	254 35.8	54.7	162 03.2	55.0	250 14.0	109	6 42.9	−125
12	55 09.6	319 03.2	+27 03.3	91 49.0	−16 44.4	269 38.0	+14 54.6	177 05.9	−17 55.0	264 43.9	110	+ 6 30.4	−124
13	70 12.0	334 04.4	03.1	106 49.9	44.0	284 40.3	54.6	192 08.5	54.9	279 13.9	110	6 18.0	−125
14	85 14.5	349 05.6	02.9	121 50.9	43.6	299 42.5	54.5	207 11.2	54.9	293 43.9	110	6 05.5	−126
15	100 16.9	4 06.7	·· 02.7	136 51.8	·· 43.2	314 44.8	·· 54.4	222 13.8	·· 54.9	308 13.9	111	· 5 52.9	−125
16	115 19.4	19 07.9	02.5	151 52.8	42.8	329 47.0	54.3	237 16.5	54.8	322 44.0	111	5 40.4	−126
17	130 21.9	34 09.1	02.4	166 53.7	42.4	344 49.3	54.3	252 19.1	54.8	337 14.1	112	5 27.8	−125
18	145 24.3	49 10.2	+27 02.2	181 54.7	−16 42.0	359 51.5	+14 54.2	267 21.8	−17 54.8	351 44.3	112	+ 5 15.3	−126
19	160 26.8	64 11.4	02.0	196 55.6	41.6	14 53.8	54.1	282 24.4	54.7	6 14.5	113	5 02.7	−127
20	175 29.3	79 12.6	01.8	211 56.6	41.2	29 56.1	54.0	297 27.1	54.7	20 44.8	113	4 50.0	−126
21	190 31.7	94 13.8	·· 01.6	226 57.6	·· 40.8	44 58.3	·· 54.0	312 29.8	·· 54.6	35 15.1	114	· 4 37.4	−126
22	205 34.2	109 15.0	01.4	241 58.5	40.5	60 00.6	53.9	327 32.4	54.6	49 45.5	114	4 24.8	−127
23	220 36.7	124 16.1	01.2	256 59.5	40.1	75 02.8	53.8	342 35.1	54.6	64 15.9	114	4 12.1	−127
24	235 39.1	139 17.3	+27 01.0	272 00.4	−16 39.7	90 05.1	+14 53.7	357 37.7	−17 54.5	78 46.3	115	+ 3 59.4	−126
code	−	+ 11	− 1	+ 10	+ 4	+ 23	0	+ 27	0				

G M T	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
15 0	180 56.0	+18 48.5	7	Acamar	315 51.2	−40 28.7
1	195 56.0	49.1	5	Achernar	335 59.0	−57 27.3
2	210 56.0	49.7	30	Acrux	173 56.8	−62 51.8
3	225 56.0	·· 50.3	19	Adhara	255 46.4	−28 55.0
4	240 56.0	50.9	10	Aldebaran	291 38.9	+16 25.3
5	255 56.0	51.5				
6	270 56.0	+18 52.1	32	Alioth	166 57.7	+56 11.9
7	285 56.0	52.7	34	Alkaid	153 32.1	+49 31.9
8	300 56.0	53.3	55	Al Na'ir	28 37.4	−47 10.1
9	315 56.0	·· 53.9	15	Alnilam	276 30.1	− 1 13.8
10	330 56.0	54.4	25	Alphard	218 38.2	− 8 28.4
11	345 56.0	55.0				
12	0 56.0	+18 55.6	41	Alphecca	126 46.9	+26 51.6
13	15 56.0	56.2	1	Alpheratz	358 28.0	+28 50.9
14	30 56.0	56.8	51	Altair	62 49.8	+ 8 45.1
15	45 56.0	·· 57.4	2	Ankaa	353 58.1	−42 32.3
16	60 56.0	58.0	42	Antares	113 18.4	−26 20.2
17	75 55.9	58.6				
18	90 55.9	+18 59.1	37	Arcturus	146 34.4	+19 24.5
19	105 55.9	18 59.7	43	Atria	108 58.2	−68 57.0
20	120 55.9	19 00.3	22	Avior	234 35.8	−59 22.5
21	135 55.9	·· 00.9	13	Bellatrix	279 18.2	+ 6 18.6
22	150 55.9	01.5	16	Betelg'se	271 47.9	+ 7 23.9
23	165 55.9	02.0				
			17	Canopus	264 15.6	−52 40.5
16 0	180 55.9	+19 02.6	12	Capella	281 38.2	+45 57.3
1	195 55.9	03.2	53	Deneb	50 00.5	+45 07.3
2	210 55.9	03.8	28	Denebola	183 17.1	+14 48.9
3	225 55.8	·· 04.4	4	Diphda	349 39.0	−18 13.5
4	240 55.8	04.9				
5	255 55.8	05.5	27	Dubhe	194 43.9	+61 59.3
6	270 55.8	+19 06.1	14	Elnath	279 07.1	+28 34.3
7	285 55.8	06.7	47	Eltanin	91 05.6	+51 29.5
8	300 55.8	07.2	54	Enif	34 29.1	+ 9 40.4
9	315 55.8	·· 07.8	56	Fomalhaut	16 11.2	−29 51.0
10	330 55.8	08.4				
11	345 55.8	09.0	31	Gacrux	172 48.3	−56 52.5
12	0 55.7	+19 09.5	29	Gienah	176 36.2	−17 18.2
13	15 55.7	10.1	35	Hadar	149 48.1	−60 10.0
14	30 55.7	10.7	6	Hamal	328 49.4	+23 15.4
15	45 55.7	·· 11.3	48	Kaus Aust.	84 40.2	−34 24.3
16	60 55.7	11.8				
17	75 55.7	12.4	40	Kochab	137 16.8	+74 20.1
18	90 55.7	+19 13.0	57	Markab	14 21.1	+14 58.2
19	105 55.6	13.5	8	Menkar	315 00.1	+ 3 55.1
20	120 55.6	14.1	36	Menkent	148 57.7	−36 09.6
21	135 55.6	·· 14.7	24	Miapl'dus	221 49.0	−69 32.7
22	150 55.6	15.3				
23	165 55.6	15.8	9	Mirfak	309 42.2	+49 42.4
			50	Nunki	76 51.1	−26 21.0
17 0	180 55.6	+19 16.4	52	Peacock	54 26.3	−56 52.3
1	195 55.6	17.0	21	Pollux	244 20.2	+28 08.0
2	210 55.5	17.5	20	Procyon	245 44.7	+ 5 20.1
3	225 55.5	·· 18.1				
4	240 55.5	18.7	46	R'alhague	96 45.9	+12 35.4
5	255 55.5	19.2	26	Regulus	208 29.0	+12 10.8
6	270 55.5	+19 19.8	11	Rigel	281 53.5	− 8 15.2
7	285 55.5	20.3	38	Rigil Kent.	140 49.7	−60 39.6
8	300 55.4	20.9	44	Sabik	103 01.3	−15 40.4
9	315 55.4	·· 21.5				
10	330 55.4	22.0	3	Schedar	350 29.8	+56 17.7
11	345 55.4	22.6	45	Shaula	97 19.7	−37 04.4
12	0 55.4	+19 23.1	18	Sirius	259 11.7	−16 39.5
13	15 55.3	23.7	33	Spica	159 16.1	−10 56.2
14	30 55.3	24.3	23	Suhail	223 24.1	−43 15.7
15	45 55.3	·· 24.8				
16	60 55.3	25.4	49	Vega	81 07.6	+38 44.4
17	75 55.3	25.9	39	Zub'g'bi	137 52.5	−15 51.8
18	90 55.2	+19 26.5				
19	105 55.2	27.1				
20	120 55.2	27.6				
21	135 55.2	·· 28.2				
22	150 55.2	28.7				
23	165 55.1	29.3				
24	180 55.1	+19 29.8				
code	—	+ 6				

Lat. N °	Sunrise h m	Twlt. begins h m
72	▭	▭
70	0 16	////
68	1 41	////
66	2 18	////
64	2 44	////
62	3 04	////
60	3 20	////
58	3 34	////
56	3 45	////
54	3 56	////
52	4 05	0 50
50	4 13	1 29
45	4 30	2 22
40	4 44	2 54
35	4 56	3 17
30	5 06	3 36
20	5 24	4 04
10	5 39	4 24
0	5 53	4 40
10	6 07	4 54
20	6 21	5 05
30	6 38	5 15
35	6 48	5 19
40	6 59	5 24
45	7 12	5 29
50	7 28	5 34
52	7 35	5 35
54	7 44	5 37
56	7 53	5 39
58	8 03	5 40
60	8 16	5 42
S		

Moonrise	15	16	17	18
	h m	h m	h m	h m
72	6 08	8 45	10 56	12 57
70	6 56	9 07	11 06	12 58
68	7 26	9 23	11 14	13 00
66	7 49	9 37	11 21	13 01
64	8 07	9 48	11 26	13 02
62	8 21	9 57	11 31	13 02
60	8 33	10 05	11 35	13 03
58	8 44	10 12	11 39	13 04
56	8 53	10 18	11 42	13 04
54	9 01	10 24	11 45	13 05
52	9 08	10 29	11 48	13 05
50	9 15	10 33	11 50	13 06
45	9 29	10 43	11 56	13 06
40	9 40	10 51	12 00	13 07
35	9 50	10 58	12 04	13 08
30	9 58	11 04	12 07	13 08
20	10 13	11 14	12 13	13 09
10	10 26	11 23	12 18	13 10
0	10 37	11 31	12 22	13 11
10	10 49	11 40	12 27	13 12
20	11 02	11 49	12 32	13 13
30	11 16	11 59	12 38	13 14
35	11 25	12 05	12 41	13 15
40	11 34	12 12	12 45	13 16
45	11 45	12 19	12 49	13 16
50	11 59	12 29	12 54	13 17
52	12 05	12 33	12 56	13 18
54	12 12	12 38	12 59	13 18
56	12 19	12 43	13 02	13 19
58	12 28	12 49	13 05	13 20
60	12 38	12 55	13 08	13 20

Lat. N °	Sunset h m	Twlt. ends h m
72	▭	▭
70	▭	▭
68	22 17	////
66	21 38	////
64	21 11	////
62	20 51	////
60	20 34	////
58	20 20	////
56	20 09	////
54	19 58	////
52	19 49	23 10
50	19 41	22 28
45	19 23	21 33
40	19 09	21 00
35	18 57	20 36
30	18 47	20 18
20	18 29	19 50
10	18 14	19 29
0	18 00	19 13
10	17 46	18 59
20	17 31	18 48
30	17 14	18 37
35	17 04	18 32
40	16 53	18 27
45	16 40	18 22
50	16 24	18 18
52	16 17	18 16
54	16 08	18 13
56	15 59	18 12
58	15 49	18 10
60	15 37	18 08
S		

Moonset	15	16	17	18
	h m	h m	h m	h m
72	2 55	2 12	1 49	1 32
70	2 05	1 48	1 37	1 27
68	1 34	1 30	1 27	1 23
66	1 10	1 16	1 18	1 20
64	0 52	1 03	1 11	1 17
62	0 36	0 53	1 05	1 14
60	0 23	0 44	1 00	1 12
58	0 12	0 36	0 55	1 10
56	0 02	0 29	0 50	1 08
54	24 23	0 23	0 47	1 07
52	24 17	0 17	0 43	1 05
50	24 12	0 12	0 40	1 04
45	24 01	0 01	0 33	1 01
40	23 52	24 27	0 27	0 59
35	23 44	24 22	0 22	0 57
30	23 37	24 17	0 17	0 55
20	23 25	24 10	0 10	0 52
10	23 14	24 03	0 03	0 49
0	23 04	23 56	24 46	0 46
10	22 53	23 49	24 43	0 43
20	22 42	23 42	24 40	0 40
30	22 30	23 34	24 37	0 37
35	22 22	23 29	24 34	0 34
40	22 14	23 24	24 32	0 32
45	22 04	23 18	24 30	0 30
50	21 52	23 10	24 26	0 26
52	21 46	23 06	24 25	0 25
54	21 40	23 03	24 23	0 23
56	21 33	22 58	24 21	0 21
58	21 25	22 53	24 19	0 19
60	21 16	22 48	24 17	0 17

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.1	0.3	0.2
30	0.1	0.3	0.1
45	0.1	0.2	0.1
60	0.1	0.1	0.1
75	0.1	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	15	16	17
°	′	′	′
0	19.0	18.3	17.7
4	19.0	18.3	17.7
8	18.9	18.3	17.7
12	18.9	18.3	17.7
16	18.9	18.2	17.6
20	18.8	18.2	17.6
24	18.7	18.1	17.5
28	18.6	18.1	17.5
32	18.5	18.0	17.4
36	18.4	17.9	17.4
40	18.3	17.8	17.3
44	18.2	17.7	17.2
48	18.0	17.6	17.1
52	17.9	17.4	17.0
56	17.7	17.3	16.9
60	17.6	17.2	16.8
64	17.4	17.0	16.7
68	17.2	16.9	16.6
72	17.0	16.8	16.5
76	16.8	16.6	16.4
80	16.7	16.5	16.3
84	16.5	16.3	16.1
88	16.3	16.2	16.0
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	15	16	17
°	′	′	′
0	13.6	14.0	14.3
4	13.6	14.0	14.3
8	13.6	14.0	14.3
12	13.7	14.0	14.4
16	13.7	14.1	14.4
20	13.8	14.1	14.4
24	13.9	14.2	14.5
28	13.9	14.2	14.5
32	14.0	14.3	14.6
36	14.2	14.4	14.7
40	14.3	14.5	14.8
44	14.4	14.6	14.8
48	14.5	14.7	14.9
52	14.7	14.9	15.0
56	14.9	15.0	15.1
60	15.0	15.1	15.2
64	15.2	15.3	15.3
68	15.4	15.4	15.4
72	15.5	15.5	15.5
76	15.7	15.7	15.7
80	15.9	15.8	15.8
84	16.1	16.0	15.9
88	16.2	16.1	16.0
90			

Subtract from table, back cover

G M T	Equation of Time (App.—Mean) 15	16	17
h	m s	m s	m s
0	+ 3 44.2	+ 3 43.5	+ 3 42.3
6	+ 3 44.1	+ 3 43.3	+ 3 41.9
12	+ 3 43.9	+ 3 43.0	+ 3 41.5
18	+ 3 43.8	+ 3 42.7	+ 3 41.0
24	+ 3 43.5	+ 3 42.3	+ 3 40.5

GMT of Transit Meridian of Greenwich	DAY	Moon	Venus	Mars	Jupiter	Saturn
		h m	h m	h m	h m	h m
	15	16 51	14 47	5 56	18 08	0 22
	16	17 44	14 45	5 55	18 04	0 18
	17	18 34	14 44	5 53	18 01	0 14
	18	19 23	14 42	5 52	17 57	0 10

Hebrew Pentecost (Shebuoth) 16
First Quarter 17

GMT	♈ GHA	VENUS −4.2 GHA	VENUS −4.2 Dec.	MARS −0.1 GHA	MARS −0.1 Dec.	JUPITER −1.6 GHA	JUPITER −1.6 Dec.	SATURN 0.2 GHA	SATURN 0.2 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
18 0	235 39.1	139 17.3	+27 01.0	272 00.4	−16 39.7	90 05.1	+14 53.7	357 37.7	−17 54.5	78 46.3	115	+ 3 59.4	−126
1	250 41.6	154 18.5	00.8	287 01.4	39.3	105 07.3	53.7	12 40.4	54.5	93 16.8	115	3 46.8	−127
2	265 44.1	169 19.7	00.6	302 02.3	38.9	120 09.6	53.6	27 43.0	54.5	107 47.3	116	3 34.1	−127
3	280 46.5	184 20.9	00.5	317 03.3	38.5	135 11.8	53.5	42 45.7	54.4	122 17.9	116	• 3 21.4	−127
4	295 49.0	199 22.1	00.3	332 04.3	38.1	150 14.1	53.4	57 48.3	54.4	136 48.5	116	3 08.7	−127
5	310 51.4	214 23.3	27 00.1	347 05.2	37.7	165 16.3	53.3	72 51.0	54.3	151 19.1	117	2 56.0	−128
6	325 53.9	229 24.6	+26 59.9	2 06.2	−16 37.3	180 18.6	+14 53.3	87 53.7	−17 54.3	165 49.8	117	+ 2 43.2	−127
7	340 56.4	244 25.8	59.7	17 07.1	36.9	195 20.8	53.2	102 56.3	54.3	180 20.5	118	2 30.5	−127
8	355 58.8	259 27.0	59.5	32 08.1	36.5	210 23.1	53.1	117 59.0	54.2	194 51.3	118	2 17.8	−127
9	11 01.3	274 28.2	59.3	47 09.1	36.1	225 25.3	53.0	133 01.6	54.2	209 22.1	118	• 2 05.1	−128
10	26 03.8	289 29.4	59.1	62 10.0	35.7	240 27.6	53.0	148 04.3	54.2	223 52.9	118	1 52.3	−127
11	41 06.2	304 30.7	58.9	77 11.0	35.3	255 29.8	52.9	163 06.9	54.1	238 23.7	119	1 39.6	−127
12	56 08.7	319 31.9	+26 58.7	92 11.9	−16 34.9	270 32.1	+14 52.8	178 09.6	−17 54.1	252 54.6	119	+ 1 26.9	−127
13	71 11.2	334 33.1	58.5	107 12.9	34.5	285 34.3	52.7	193 12.2	54.0	267 25.5	120	1 14.2	−128
14	86 13.6	349 34.4	58.3	122 13.9	34.1	300 36.6	52.7	208 14.9	54.0	281 56.5	119	1 01.4	−127
15	101 16.1	4 35.6	58.1	137 14.8	33.7	315 38.8	52.6	223 17.6	54.0	296 27.4	120	• 0 48.7	−127
16	116 18.5	19 36.8	57.9	152 15.8	33.4	330 41.1	52.5	238 20.2	53.9	310 58.4	120	0 36.0	−127
17	131 21.0	34 38.1	57.7	167 16.8	33.0	345 43.3	52.4	253 22.9	53.9	325 29.4	121	0 23.3	−127
18	146 23.5	49 39.3	+26 57.5	182 17.7	−16 32.6	0 45.5	+14 52.3	268 25.5	−17 53.9	340 00.5	120	+ 0 10.6	−127
19	161 25.9	64 40.6	57.3	197 18.7	32.2	15 47.8	52.3	283 28.2	53.8	354 31.5	121	− 0 02.1	−127
20	176 28.4	79 41.8	57.1	212 19.6	31.8	30 50.0	52.2	298 30.8	53.8	9 02.6	121	0 14.8	−126
21	191 30.9	94 43.1	56.9	227 20.6	31.4	45 52.3	52.1	313 33.5	53.7	23 33.7	122	• 0 27.4	−127
22	206 33.3	109 44.4	56.7	242 21.6	31.0	60 54.5	52.0	328 36.1	53.7	38 04.9	121	0 40.1	−126
23	221 35.8	124 45.6	56.5	257 22.5	30.6	75 56.8	51.9	343 38.8	53.7	52 36.0	122	0 52.7	−127
19 0	236 38.3	139 46.9	+26 56.3	272 23.5	−16 30.2	90 59.0	+14 51.9	358 41.5	−17 53.6	67 07.2	122	− 1 05.4	−126
1	251 40.7	154 48.2	56.1	287 24.5	29.8	106 01.3	51.8	13 44.1	53.6	81 38.4	122	1 18.0	−126
2	266 43.2	169 49.5	55.8	302 25.4	29.4	121 03.5	51.7	28 46.8	53.6	96 09.6	123	1 30.6	−125
3	281 45.7	184 50.7	55.6	317 26.4	29.0	136 05.8	51.6	43 49.4	53.5	110 40.9	122	• 1 43.1	−126
4	296 48.1	199 52.0	55.4	332 27.4	28.6	151 08.0	51.6	58 52.1	53.5	125 12.1	123	1 55.7	−126
5	311 50.6	214 53.3	55.2	347 28.3	28.2	166 10.3	51.5	73 54.7	53.4	139 43.4	123	2 08.3	−125
6	326 53.0	229 54.6	+26 55.0	2 29.3	−16 27.8	181 12.5	+14 51.4	88 57.4	−17 53.4	154 14.7	122	− 2 20.8	−125
7	341 55.5	244 55.9	54.8	17 30.3	27.4	196 14.7	51.3	104 00.1	53.4	168 45.9	123	2 33.3	−125
8	356 58.0	259 57.2	54.6	32 31.2	27.0	211 17.0	51.2	119 02.7	53.3	183 17.2	124	2 45.8	−124
9	12 00.4	274 58.5	54.4	47 32.2	26.6	226 19.2	51.2	134 05.4	53.3	197 48.6	123	• 2 58.2	−125
10	27 02.9	289 59.8	54.2	62 33.2	26.2	241 21.5	51.1	149 08.0	53.3	212 19.9	123	3 10.7	−124
11	42 05.4	305 01.1	54.0	77 34.1	25.8	256 23.7	51.0	164 10.7	53.2	226 51.2	124	3 23.1	−123
12	57 07.8	320 02.4	+26 53.7	92 35.1	−16 25.4	271 26.0	+14 50.9	179 13.3	−17 53.2	241 22.6	123	− 3 35.4	−124
13	72 10.3	335 03.7	53.5	107 36.1	25.0	286 28.2	50.8	194 16.0	53.1	255 53.9	124	3 47.8	−123
14	87 12.8	350 05.0	53.3	122 37.0	24.6	301 30.4	50.8	209 18.6	53.1	270 25.3	124	4 00.1	−123
15	102 15.2	5 06.4	53.1	137 38.0	24.2	316 32.7	50.7	224 21.3	53.1	284 56.7	124	• 4 12.4	−123
16	117 17.7	20 07.7	52.9	152 39.0	23.9	331 34.9	50.6	239 24.0	53.0	299 28.1	123	4 24.7	−122
17	132 20.2	35 09.0	52.7	167 39.9	23.5	346 37.2	50.5	254 26.6	53.0	313 59.4	124	4 36.9	−123
18	147 22.6	50 10.3	+26 52.5	182 40.9	−16 23.1	1 39.4	+14 50.4	269 29.3	−17 52.9	328 30.8	124	− 4 49.2	−121
19	162 25.1	65 11.7	52.2	197 41.9	22.7	16 41.6	50.4	284 31.9	52.9	343 02.2	124	5 01.3	−122
20	177 27.5	80 13.0	52.0	212 42.9	22.3	31 43.9	50.3	299 34.6	52.9	357 33.6	124	5 13.5	−121
21	192 30.0	95 14.3	51.8	227 43.8	21.9	46 46.1	50.2	314 37.2	52.8	12 05.0	124	• 5 25.6	−121
22	207 32.5	110 15.7	51.6	242 44.8	21.5	61 48.4	50.1	329 39.9	52.8	26 36.4	124	5 37.7	−120
23	222 34.9	125 17.0	51.4	257 45.8	21.1	76 50.6	50.0	344 42.5	52.8	41 07.8	124	5 49.7	−120
20 0	237 37.4	140 18.4	+26 51.2	272 46.7	−16 20.7	91 52.8	+14 49.9	359 45.2	−17 52.7	55 39.2	124	− 6 01.7	−120
1	252 39.9	155 19.7	50.9	287 47.7	20.3	106 55.1	49.9	14 47.9	52.7	70 10.6	124	6 13.7	−119
2	267 42.3	170 21.1	50.7	302 48.7	19.9	121 57.3	49.8	29 50.5	52.6	84 42.0	124	6 25.6	−119
3	282 44.8	185 22.5	50.5	317 49.7	19.5	136 59.6	49.7	44 53.2	52.6	99 13.4	124	• 6 37.5	−118
4	297 47.3	200 23.8	50.3	332 50.6	19.1	152 01.8	49.6	59 55.8	52.6	113 44.8	124	6 49.3	−118
5	312 49.7	215 25.2	50.1	347 51.6	18.7	167 04.0	49.5	74 58.5	52.5	128 16.2	124	7 01.1	−118
6	327 52.2	230 26.6	+26 49.8	2 52.6	−16 18.3	182 06.3	+14 49.5	90 01.1	−17 52.5	142 47.6	124	− 7 12.9	−117
7	342 54.7	245 27.9	49.6	17 53.6	17.9	197 08.5	49.4	105 03.8	52.5	157 19.0	124	7 24.6	−117
8	357 57.1	260 29.3	49.4	32 54.5	17.5	212 10.8	49.3	120 06.4	52.4	171 50.4	123	7 36.3	−116
9	12 59.6	275 30.7	49.2	47 55.5	17.1	227 13.0	49.2	135 09.1	52.4	186 21.7	124	• 7 47.9	−116
10	28 02.0	290 32.1	48.9	62 56.5	16.7	242 15.2	49.1	150 11.8	52.3	200 53.1	123	7 59.5	−115
11	43 04.5	305 33.5	48.7	77 57.4	16.3	257 17.5	49.1	165 14.4	52.3	215 24.4	124	8 11.0	−115
12	58 07.0	320 34.9	+26 48.5	92 58.4	−16 15.9	272 19.7	+14 49.0	180 17.1	−17 52.3	229 55.8	123	− 8 22.5	−114
13	73 09.4	335 36.3	48.3	107 59.4	15.5	287 21.9	48.9	195 19.7	52.2	244 27.1	124	8 33.9	−114
14	88 11.9	350 37.7	48.0	123 00.4	15.1	302 24.2	48.8	210 22.4	52.2	258 58.5	123	8 45.3	−114
15	103 14.4	5 39.1	47.8	138 01.4	14.7	317 26.4	48.7	225 25.0	52.2	273 29.8	123	• 8 56.7	−112
16	118 16.8	20 40.5	47.6	153 02.3	14.3	332 28.6	48.6	240 27.7	52.1	288 01.1	123	9 07.9	−113
17	133 19.3	35 41.9	47.3	168 03.3	13.9	347 30.9	48.6	255 30.4	52.1	302 32.4	123	9 19.2	−112
18	148 21.8	50 43.3	+26 47.1	183 04.3	−16 13.5	2 33.1	+14 48.5	270 33.0	−17 52.0	317 03.7	123	− 9 30.4	−111
19	163 24.2	65 44.7	46.9	198 05.3	13.1	17 35.4	48.4	285 35.7	52.0	331 35.0	122	9 41.5	−111
20	178 26.7	80 46.1	46.7	213 06.2	12.7	32 37.6	48.3	300 38.3	52.0	346 06.2	123	9 52.6	−110
21	193 29.2	95 47.5	46.4	228 07.2	12.3	47 39.8	48.2	315 41.0	51.9	0 37.5	122	•10 03.6	−109
22	208 31.6	110 49.0	46.2	243 08.2	11.9	62 42.1	48.1	330 43.6	51.9	15 08.7	122	10 14.5	−109
23	223 34.1	125 50.4	46.0	258 09.2	11.5	77 44.3	48.1	345 46.3	51.9	29 39.9	122	10 25.4	−109
24	238 36.5	140 51.8	+26 45.7	273 10.2	−16 11.1	92 46.5	+14 48.0	0 48.9	−17 51.8	44 11.1	122	−10 36.3	−108
code	−	+ 13	− 2	+ 10	+ 4	+ 22	− 1	+ 27	+ 1				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
18 00	180 55.1	+19 29.8	7	Acamar	315 51.2	−40 28.7
01	195 55.1	30.4	5	Achernar	335 59.0	−57 27.3
02	210 55.1	30.9	30	Acrux	173 56.8	−62 51.8
03	225 55.1	·· 31.5	19	Adhara	255 46.4	−28 54.9
04	240 55.0	32.0	10	Aldebaran	291 38.9	+16 25.3
05	255 55.0	32.6				
06	270 55.0	+19 33.1	32	Alioth	166 57.8	+56 11.9
07	285 55.0	33.7	34	Alkaid	153 32.1	+49 31.9
08	300 54.9	34.2	55	Al Na'ir	28 37.4	−47 10.1
09	315 54.9	·· 34.8	15	Alnilam	276 30.1	− 1 13.8
10	330 54.9	35.3	25	Alphard	218 38.2	− 8 28.4
11	345 54.9	35.9				
12	0 54.9	+19 36.4	41	Alphecca	126 46.9	+26 51.6
13	15 54.8	37.0	1	Alpheratz	358 28.0	+28 50.9
14	30 54.8	37.5	51	Altair	62 49.8	+ 8 45.1
15	45 54.8	·· 38.1	2	Ankaa	353 58.1	−42 32.3
16	60 54.8	38.6	42	Antares	113 18.4	−26 20.2
17	75 54.7	39.1				
18	90 54.7	+19 39.7	37	Arcturus	146 34.4	+19 24.5
19	105 54.7	40.2	43	Atria	108 58.1	−68 57.0
20	120 54.7	40.8	22	Avior	234 35.8	−59 22.5
21	135 54.6	·· 41.3	13	Bellatrix	279 18.2	+ 6 18.6
22	150 54.6	41.9	16	Betelg'se	271 47.9	+ 7 23.9
23	165 54.6	42.4				
			17	Canopus	264 15.6	−52 40.5
19 00	180 54.5	+19 42.9	12	Capella	281 38.2	+45 57.3
01	195 54.5	43.5	53	Deneb	50 00.5	+45 07.3
02	210 54.5	44.0	28	Denebola	183 17.1	+14 48.9
03	225 54.5	·· 44.5	4	Diphda	349 39.0	−18 13.4
04	240 54.4	45.1				
05	255 54.4	45.6	27	Dubhe	194 43.9	+61 59.4
06	270 54.4	+19 46.2	14	Elnath	279 07.1	+28 34.3
07	285 54.4	46.7	47	Eltanin	91 05.5	+51 29.5
08	300 54.3	47.2	54	Enif	34 29.1	+ 9 40.4
09	315 54.3	·· 47.8	56	Fomalhaut	16 11.2	−29 51.0
10	330 54.3	48.3				
11	345 54.2	48.8	31	Gacrux	172 48.3	−56 52.5
12	0 54.2	+19 49.4	29	Gienah	176 36.2	−17 18.2
13	15 54.2	49.9	35	Hadar	149 48.1	−60 10.1
14	30 54.1	50.4	6	Hamal	328 49.4	+23 15.4
15	45 54.1	·· 50.9	48	Kaus Aust.	84 40.2	−34 24.3
16	60 54.1	51.5				
17	75 54.1	52.0	40	Kochab	137 16.9	+74 20.1
18	90 54.0	+19 52.5	57	Markab	14 21.1	+14 58.2
19	105 54.0	53.1	8	Menkar	315 00.1	+ 3 55.1
20	120 54.0	53.6	36	Menkent	148 57.7	−36 09.6
21	135 53.9	·· 54.1	24	Miapl'dus	221 49.1	−69 32.7
22	150 53.9	54.6				
23	165 53.9	55.2	9	Mirfak	309 42.2	+49 42.4
			50	Nunki	76 51.0	−26 21.0
20 00	180 53.8	+19 55.7	52	Peacock	54 26.3	−56 52.3
01	195 53.8	56.2	21	Pollux	244 20.2	+28 08.0
02	210 53.8	56.7	20	Procyon	245 44.7	+ 5 20.2
03	225 53.7	·· 57.3				
04	240 53.7	57.8	46	R'alhague	96 45.9	+12 35.4
05	255 53.7	58.3	26	Regulus	208 29.0	+12 10.8
06	270 53.6	+19 58.8	11	Rigel	281 53.5	− 8 15.2
07	285 53.6	59.4	38	Rigil Kent.	140 49.7	−60 39.6
08	300 53.6	19 59.9	44	Sabik	103 01.3	−15 40.4
09	315 53.5	·20 00.4				
10	330 53.5	00.9	3	Schedar	350 29.8	+56 17.7
11	345 53.5	01.4	45	Shaula	97 19.6	−37 04.4
12	0 53.4	+20 02.0	18	Sirius	259 11.7	−16 39.5
13	15 53.4	02.5	33	Spica	159 16.1	−10 56.2
14	30 53.4	03.0	23	Suhail	223 24.1	−43 15.7
15	45 53.3	·· 03.5				
16	60 53.3	04.0	49	Vega	81 07.6	+38 44.4
17	75 53.3	04.5	39	Zub'g'bi	137 52.5	−15 51.8
18	90 53.2	+20 05.1				
19	105 53.2	05.6				
20	120 53.1	06.1				
21	135 53.1	·· 06.6				
22	150 53.1	07.1				
23	165 53.0	07.6				
24	180 53.0	+20 08.1				
code	—	+ 5				

Lat.	Sunrise	Twlt. begins	Moonrise 18	19	20	21
N °	h m	h m	h m	h m	h m	h m
72	□	□	12 57	14 54	16 52	19 00
70	□	□	12 58	14 48	16 37	18 30
68	1 23	////	13 00	14 43	16 25	18 08
66	2 06	////	13 01	14 38	16 15	17 51
64	2 34	////	13 02	14 35	16 06	17 38
62	2 56	////	13 02	14 32	15 59	17 26
60	3 13	////	13 03	14 29	15 53	17 16
58	3 28	////	13 04	14 27	15 48	17 08
56	3 40	////	13 04	14 24	15 43	17 01
54	3 51	////	13 05	14 23	15 39	16 54
52	4 00	0 26	13 05	14 21	15 35	16 48
50	4 09	1 18	13 06	14 19	15 31	16 43
45	4 27	2 16	13 06	14 16	15 24	16 31
40	4 41	2 49	13 07	14 13	15 18	16 22
35	4 54	3 14	13 08	14 11	15 12	16 14
30	5 04	3 33	13 08	14 09	15 08	16 07
20	5 23	4 02	13 09	14 05	15 00	15 54
10	5 38	4 23	13 10	14 02	14 53	15 44
0	5 53	4 40	13 11	13 59	14 46	15 34
10	6 07	4 53	13 12	13 56	14 40	15 24
20	6 23	5 05	13 13	13 53	14 33	15 14
30	6 40	5 16	13 14	13 49	14 25	15 02
35	6 50	5 21	13 15	13 47	14 20	14 55
40	7 02	5 27	13 16	13 45	14 15	14 47
45	7 15	5 31	13 16	13 43	14 10	14 38
50	7 32	5 36	13 17	13 40	14 03	14 28
52	7 40	5 38	13 18	13 38	13 59	14 23
54	7 48	5 41	13 18	13 37	13 56	14 17
56	7 58	5 42	13 19	13 35	13 52	14 11
58	8 09	5 45	13 20	13 33	13 48	14 04
60	8 22	5 47	13 20	13 31	13 43	13 57
S						

Lat.	Sunset	Twlt. ends	Moonset 18	19	20	21
N °	h m	h m	h m	h m	h m	h m
72	□	□	1 32	1 16	0 59	0 40
70	□	□	1 27	1 18	1 08	0 57
68	22 36	////	1 23	1 19	1 15	1 11
66	21 50	////	1 20	1 21	1 21	1 23
64	21 21	////	1 17	1 22	1 26	1 32
62	20 59	////	1 14	1 23	1 31	1 40
60	20 41	////	1 12	1 24	1 35	1 48
58	20 27	////	1 10	1 24	1 38	1 54
56	20 14	////	1 08	1 25	1 42	1 59
54	20 03	////	1 07	1 26	1 44	2 04
52	19 53	23 43	1 05	1 26	1 47	2 09
50	19 45	22 39	1 04	1 27	1 49	2 13
45	19 27	21 40	1 01	1 28	1 54	2 22
40	19 12	21 05	0 59	1 29	1 59	2 30
35	19 00	20 40	0 57	1 30	2 03	2 36
30	18 49	20 21	0 55	1 31	2 06	2 42
20	18 31	19 52	0 52	1 32	2 12	2 52
10	18 15	19 30	0 49	1 33	2 17	3 01
0	18 00	19 13	0 46	1 34	2 21	3 09
10	17 46	19 00	0 43	1 35	2 26	3 17
20	17 30	18 47	0 40	1 36	2 31	3 26
30	17 13	18 36	0 37	1 37	2 37	3 36
35	17 02	18 30	0 34	1 38	2 40	3 42
40	16 51	18 26	0 32	1 39	2 44	3 49
45	16 37	18 20	0 30	1 40	2 49	3 56
50	16 21	18 15	0 26	1 41	2 54	4 06
52	16 13	18 13	0 25	1 41	2 56	4 10
54	16 04	18 10	0 23	1 42	2 59	4 15
56	15 54	18 08	0 21	1 42	3 02	4 20
58	15 43	18 06	0 19	1 43	3 05	4 26
60	15 31	18 04	0 17	1 44	3 09	4 33
S						

GMT	Equation of Time (App. − Mean) 18	19	20
h	m s	m s	m s
0	+ 3 40.5	+ 3 38.2	+ 3 35.4
6	+ 3 40.0	+ 3 37.6	+ 3 34.6
12	+ 3 39.5	+ 3 36.9	+ 3 33.8
18	+ 3 38.9	+ 3 36.2	+ 3 32.9
24	+ 3 38.2	+ 3 35.4	+ 3 32.1

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
18	19 23	14 42	5 52	17 57	0 10
19	20 10	14 40	5 50	17 53	0 05
20	20 57	14 37	5 49	17 50	0 01 / 23 57
21	21 45	14 35	5 47	17 46	23 53

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.1	0.3	0.2
30	0.1	0.3	0.1
45	0.1	0.2	0.1
60	0.1	0.1	0.1
75	0.1	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	18	19	20
°	′	′	′
0	16.9	16.2	15.6
4	16.9	16.2	15.6
8	16.9	16.2	15.6
12	16.9	16.2	15.6
16	16.9	16.2	15.6
20	16.9	16.2	15.6
24	16.8	16.1	15.6
28	16.8	16.1	15.6
32	16.8	16.1	15.6
36	16.7	16.1	15.6
40	16.7	16.1	15.6
44	16.6	16.0	15.6
48	16.6	16.0	15.6
52	16.5	16.0	15.6
56	16.4	16.0	15.6
60	16.4	15.9	15.6
64	16.3	15.9	15.6
68	16.2	15.9	15.6
72	16.2	15.8	15.6
76	16.1	15.8	15.6
80	16.0	15.8	15.6
84	15.9	15.7	15.6
88	15.9	15.7	15.6
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	18	19	20
°	′	′	′
0	14.8	15.2	15.6
4	14.8	15.2	15.6
8	14.8	15.2	15.6
12	14.8	15.2	15.6
16	14.8	15.2	15.6
20	14.8	15.2	15.6
24	14.9	15.2	15.6
28	14.9	15.3	15.6
32	14.9	15.3	15.6
36	15.0	15.3	15.6
40	15.0	15.3	15.6
44	15.1	15.3	15.6
48	15.1	15.4	15.6
52	15.2	15.4	15.6
56	15.3	15.4	15.6
60	15.3	15.5	15.6
64	15.4	15.5	15.6
68	15.5	15.5	15.6
72	15.5	15.5	15.6
76	15.6	15.6	15.6
80	15.7	15.6	15.6
84	15.8	15.7	15.6
88	15.8	15.7	15.6
90			

Subtract from table, back cover

Pentecost (Whit Sunday) 20

GMT	♈ GHA	VENUS — 4.2 GHA	Dec	MARS — 0.1 GHA	Dec.	JUPITER — 1.6 GHA	Dec.	SATURN 0.2 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
21 0	238 36.5	140 51.8	+26 45.7	273 10.2	−16 11.1	92 46.5	+14 48.0	0 48.9	−17 51.8	44 11.1	122	−10 36.3	−108
1	253 39.0	155 53.3	45.5	288 11.1	10.7	107 48.8	47.9	15 51.6	51.8	58 42.3	122	10 47.1	−107
2	268 41.5	170 54.7	45.3	303 12.1	10.3	122 51.0	47.8	30 54.3	51.7	73 13.5	121	10 57.8	−107
3	283 43.9	185 56.2	·· 45.0	318 13.1	·· 09.9	137 53.2	·· 47.7	45 56.9	·· 51.7	87 44.6	122	·11 08.5	−106
4	298 46.4	200 57.6	44.8	333 14.1	09.5	152 55.5	47.6	60 59.6	51.7	102 15.8	121	11 19.1	−105
5	313 48.9	215 59.1	44.6	348 15.0	09.2	167 57.7	47.6	76 02.2	51.6	116 46.9	121	11 29.6	−105
6	328 51.3	231 00.5	+26 44.3	3 16.0	−16 08.8	182 59.9	+14 47.5	91 04.9	−17 51.6	131 18.0	121	−11 40.1	−104
7	343 53.8	246 02.0	44.1	18 17.0	08.4	198 02.2	47.4	106 07.5	51.6	145 49.1	121	11 50.5	−104
8	358 56.3	261 03.4	43.8	33 18.0	08.0	213 04.4	47.3	121 10.2	51.5	160 20.2	120	12 00.9	−102
9	13 58.7	276 04.9	·· 43.6	48 19.0	·· 07.6	228 06.6	·· 47.2	136 12.8	·· 51.5	174 51.2	120	·12 11.1	−103
10	29 01.2	291 06.4	43.4	63 20.0	07.2	243 08.8	47.1	151 15.5	51.4	189 22.2	121	12 21.4	−101
11	44 03.6	306 07.8	43.1	78 20.9	06.8	258 11.1	47.1	166 18.2	51.4	203 53.3	119	12 31.5	−101
12	59 06.1	321 09.3	+26 42.9	93 21.9	−16 06.4	273 13.3	+14 47.0	181 20.8	−17 51.4	218 24.2	120	−12 41.6	−100
13	74 08.6	336 10.8	42.6	108 22.9	06.0	288 15.5	46.9	196 23.5	51.3	232 55.2	120	12 51.6	−100
14	89 11.0	351 12.3	42.4	123 23.9	05.6	303 17.8	46.8	211 26.1	51.3	247 26.2	119	13 01.6	− 98
15	104 13.5	6 13.8	·· 42.2	138 24.9	·· 05.2	318 20.0	·· 46.7	226 28.8	·· 51.3	261 57.1	119	·13 11.4	− 98
16	119 16.0	21 15.3	41.9	153 25.9	04.8	333 22.2	46.6	241 31.4	51.2	276 28.0	119	13 21.2	− 98
17	134 18.4	36 16.8	41.7	168 26.8	04.4	348 24.5	46.6	256 34.1	51.2	290 58.9	119	13 31.0	− 96
18	149 20.9	51 18.3	+26 41.4	183 27.8	−16 04.0	3 26.7	+14 46.5	271 36.8	−17 51.2	305 29.8	118	−13 40.6	− 96
19	164 23.4	66 19.8	41.2	198 28.8	03.6	18 28.9	46.4	286 39.4	51.1	320 00.6	118	13 50.2	− 95
20	179 25.8	81 21.3	41.0	213 29.8	03.2	33 31.1	46.3	301 42.1	51.1	334 31.4	118	13 59.7	− 95
21	194 28.3	96 22.8	·· 40.7	228 30.8	·· 02.8	48 33.4	·· 46.2	316 44.7	·· 51.0	349 02.2	118	·14 09.2	− 93
22	209 30.8	111 24.3	40.5	243 31.8	02.4	63 35.6	46.1	331 47.4	51.0	3 33.0	117	14 18.5	− 93
23	224 33.2	126 25.8	40.2	258 32.7	02.0	78 37.8	46.1	346 50.0	51.0	18 03.7	118	14 27.8	− 92
22 0	239 35.7	141 27.3	+26 40.0	273 33.7	−16 01.6	93 40.1	+14 46.0	1 52.7	−17 50.9	32 34.5	117	−14 37.0	− 92
1	254 38.1	156 28.9	39.7	288 34.7	01.2	108 42.3	45.9	16 55.3	50.9	47 05.2	117	14 46.2	− 90
2	269 40.6	171 30.4	39.5	303 35.7	00.8	123 44.5	45.8	31 58.0	50.9	61 35.9	116	14 55.2	− 90
3	284 43.1	186 31.9	·· 39.2	318 36.7	·· 00.4	138 46.7	·· 45.7	47 00.7	·· 50.8	76 06.5	117	·15 04.2	− 89
4	299 45.5	201 33.4	39.0	333 37.7	16 00.0	153 49.0	45.6	62 03.3	50.8	90 37.2	116	15 13.1	− 88
5	314 48.0	216 35.0	38.7	348 38.7	15 59.6	168 51.2	45.5	77 06.0	50.7	105 07.8	116	15 21.9	− 87
6	329 50.5	231 36.5	+26 38.5	3 39.6	−15 59.2	183 53.4	+14 45.5	92 08.6	−17 50.7	119 38.4	115	−15 30.6	− 87
7	344 52.9	246 38.1	38.2	18 40.6	58.8	198 55.6	45.4	107 11.3	50.7	134 08.9	116	15 39.3	− 86
8	359 55.4	261 39.6	38.0	33 41.6	58.4	213 57.9	45.3	122 13.9	50.6	148 39.5	115	15 47.9	− 85
9	14 57.9	276 41.2	·· 37.7	48 42.6	·· 58.0	229 00.1	·· 45.2	137 16.6	·· 50.6	163 10.0	115	·15 56.4	− 84
10	30 00.3	291 42.7	37.5	63 43.6	57.6	244 02.3	45.1	152 19.2	50.6	177 40.5	114	16 04.8	− 83
11	45 02.8	306 44.3	37.2	78 44.6	57.2	259 04.5	45.0	167 21.9	50.5	192 10.9	115	16 13.1	− 82
12	60 05.3	321 45.9	+26 37.0	93 45.6	−15 56.8	274 06.8	+14 44.9	182 24.6	−17 50.5	206 41.4	114	−16 21.3	− 81
13	75 07.7	336 47.4	36.7	108 46.6	56.4	289 09.0	44.9	197 27.2	50.4	221 11.8	114	16 29.4	− 81
14	90 10.2	351 49.0	36.5	123 47.6	56.0	304 11.2	44.8	212 29.9	50.4	235 42.2	114	16 37.5	− 80
15	105 12.6	6 50.6	·· 36.2	138 48.6	·· 55.6	319 13.4	·· 44.7	227 32.5	·· 50.4	250 12.6	113	·16 45.5	− 79
16	120 15.1	21 52.2	36.0	153 49.5	55.2	334 15.7	44.6	242 35.2	50.3	264 42.9	114	16 53.4	− 78
17	135 17.6	36 53.7	35.7	168 50.5	54.8	349 17.9	44.5	257 37.8	50.3	279 13.3	113	17 01.2	− 77
18	150 20.0	51 55.3	+26 35.5	183 51.5	−15 54.4	4 20.1	+14 44.4	272 40.5	−17 50.3	293 43.6	112	−17 08.9	− 76
19	165 22.5	66 56.9	35.2	198 52.5	54.0	19 22.3	44.3	287 43.1	50.2	308 13.8	113	17 16.5	− 75
20	180 25.0	81 58.5	34.9	213 53.5	53.6	34 24.6	44.2	302 45.8	50.2	322 44.1	112	17 24.0	− 74
21	195 27.4	97 00.1	·· 34.7	228 54.5	·· 53.2	49 26.8	·· 44.2	317 48.5	·· 50.1	337 14.3	112	·17 31.4	− 74
22	210 29.9	112 01.7	34.4	243 55.5	52.8	64 29.0	44.1	332 51.1	50.1	351 44.5	112	17 38.8	− 72
23	225 32.4	127 03.3	34.2	258 56.5	52.4	79 31.2	44.0	347 53.8	50.1	6 14.7	112	17 46.0	− 72
23 0	240 34.8	142 04.9	+26 33.9	273 57.5	−15 52.0	94 33.5	+14 43.9	2 56.4	−17 50.0	20 44.9	111	−17 53.2	− 71
1	255 37.3	157 06.5	33.6	288 58.5	51.6	109 35.7	43.8	17 59.1	50.0	35 15.0	111	18 00.3	− 69
2	270 39.7	172 08.2	33.4	303 59.5	51.2	124 37.9	43.7	33 01.7	50.0	49 45.1	111	18 07.2	− 69
3	285 42.2	187 09.8	·· 33.1	319 00.5	·· 50.8	139 40.1	·· 43.6	48 04.4	·· 49.9	64 15.2	111	·18 14.1	− 68
4	300 44.7	202 11.4	32.9	334 01.5	50.4	154 42.3	43.6	63 07.0	49.9	78 45.3	111	18 20.9	− 67
5	315 47.1	217 13.0	32.6	349 02.4	50.0	169 44.6	43.5	78 09.7	49.8	93 15.4	110	18 27.6	− 66
6	330 49.6	232 14.7	+26 32.3	4 03.4	−15 49.6	184 46.8	+14 43.4	93 12.4	−17 49.8	107 45.4	110	−18 34.2	− 64
7	345 52.1	247 16.3	32.1	19 04.4	49.2	199 49.0	43.3	108 15.0	49.8	122 15.4	110	18 40.6	− 64
8	0 54.5	262 17.9	31.8	34 05.4	48.8	214 51.2	43.2	123 17.7	49.7	136 45.4	110	18 47.0	− 63
9	15 57.0	277 19.6	·· 31.6	49 06.4	·· 48.4	229 53.4	·· 43.1	138 20.3	·· 49.7	151 15.4	109	·18 53.3	− 62
10	30 59.5	292 21.2	31.3	64 07.4	48.0	244 55.7	43.0	153 23.0	49.7	165 45.3	109	18 59.5	− 61
11	46 01.9	307 22.9	31.0	79 08.4	47.6	259 57.9	42.9	168 25.6	49.6	180 15.2	110	19 05.6	− 60
12	61 04.4	322 24.5	+26 30.8	94 09.4	−15 47.2	275 00.1	+14 42.9	183 28.3	−17 49.6	194 45.2	108	−19 11.6	− 59
13	76 06.9	337 26.2	30.5	109 10.4	46.8	290 02.3	42.8	198 30.9	49.5	209 15.0	109	19 17.5	− 58
14	91 09.3	352 27.8	30.2	124 11.4	46.4	305 04.5	42.7	213 33.6	49.5	223 44.9	109	19 23.3	− 58
15	106 11.8	7 29.5	·· 30.0	139 12.4	·· 46.0	320 06.7	·· 42.6	228 36.3	·· 49.5	238 14.8	108	·19 29.1	− 56
16	121 14.2	22 31.2	29.7	154 13.4	45.6	335 09.0	42.5	243 38.9	49.4	252 44.6	108	19 34.7	− 55
17	136 16.7	37 32.9	29.4	169 14.4	45.2	350 11.2	42.4	258 41.6	49.4	267 14.4	108	19 40.2	− 54
18	151 19.2	52 34.5	+26 29.2	184 15.4	−15 44.8	5 13.4	+14 42.3	273 44.2	−17 49.4	281 44.2	108	−19 45.6	− 52
19	166 21.6	67 36.2	28.9	199 16.4	44.4	20 15.6	42.2	288 46.9	49.3	296 14.0	108	19 50.8	− 52
20	181 24.1	82 37.9	28.6	214 17.4	44.0	35 17.8	42.1	303 49.5	49.3	310 43.8	108	19 56.0	− 51
21	196 26.6	97 39.6	·· 28.4	229 18.4	·· 43.6	50 20.1	·· 42.1	318 52.2	·· 49.3	325 13.6	107	·20 01.1	− 50
22	211 29.0	112 41.3	28.1	244 19.4	43.2	65 22.3	42.0	333 54.8	49.2	339 43.3	107	20 06.1	− 49
23	226 31.5	127 43.0	27.8	259 20.4	42.8	80 24.5	41.9	348 57.5	49.2	354 13.0	108	20 11.0	− 48
24	241 34.0	142 44.7	+26 27.5	274 21.4	−15 42.4	95 26.7	+14 41.8	4 00.2	−17 49.1	8 42.8	107	−20 15.8	− 47
code	—	+ 15	− 3	+ 10	+ 4	+ 22	0	+ 26	+ 1				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
21 0	180 53.0	+20 08.1	7	Acamar	315 51.2	−40 28.7
1	195 53.0	08.6	5	Achernar	335 59.0	−57 27.3
2	210 52.9	09.1	30	Acrux	173 56.8	−62 51.8
3	225 52.9	·· 09.7	19	Adhara	255 46.4	−28 54.9
4	240 52.8	10.2	10	Aldebaran	291 38.9	+16 25.3
5	255 52.8	10.7				
6	270 52.8	+20 11.2	32	Alioth	166 57.8	+56 11.9
7	285 52.7	11.7	34	Alkaid	153 32.1	+49 31.9
8	300 52.7	12.2	55	Al Na'ir	28 37.3	−47 10.1
9	315 52.6	·· 12.7	15	Alnilam	276 30.1	− 1 13.8
10	330 52.6	13.2	25	Alphard	218 38.2	− 8 28.3
11	345 52.6	13.7				
12	0 52.5	+20 14.2	41	Alphecca	126 46.9	+26 51.6
13	15 52.5	14.7	1	Alpheratz	358 28.0	+28 50.9
14	30 52.4	15.2	51	Altair	62 49.7	+ 8 45.1
15	45 52.4	·· 15.7	2	Ankaa	353 58.1	−42 32.3
16	60 52.4	16.2	42	Antares	113 18.4	−26 20.2
17	75 52.3	16.7				
18	90 52.3	+20 17.2	37	Arcturus	146 34.4	+19 24.5
19	105 52.2	17.7	43	Atria	108 58.1	−68 57.0
20	120 52.2	18.2	22	Avior	234 35.9	−59 22.5
21	135 52.2	·· 18.7	13	Bellatrix	279 18.2	+ 6 18.6
22	150 52.1	19.2	16	Betelg'se	271 47.9	+ 7 23.9
23	165 52.1	19.7				
			17	Canopus	264 15.6	−52 40.5
22 0	180 52.0	+20 20.2	12	Capella	281 38.2	+45 57.3
1	195 52.0	20.7	53	Deneb	50 00.5	+45 07.3
2	210 51.9	21.2	28	Denebola	183 17.1	+14 48.9
3	225 51.9	·· 21.7	4	Diphda	349 39.0	−18 13.4
4	240 51.8	22.2				
5	255 51.8	22.7	27	Dubhe	194 43.9	+61 59.4
6	270 51.8	+20 23.2	14	Elnath	279 07.1	+28 34.3
7	285 51.7	23.7	47	Eltanin	91 05.5	+51 29.5
8	300 51.7	24.2	54	Enif	34 29.1	+ 9 40.5
9	315 51.6	·· 24.7	56	Fomalhaut	16 11.2	−29 51.0
10	330 51.6	25.1				
11	345 51.5	25.6	31	Gacrux	172 48.3	−56 52.5
12	0 51.5	+20 26.1	29	Gienah	176 36.2	−17 18.2
13	15 51.4	26.6	35	Hadar	149 48.1	−60 10.1
14	30 51.4	27.1	6	Hamal	328 49.4	+23 15.4
15	45 51.4	·· 27.6	48	Kaus Aust.	84 40.2	−34 24.3
16	60 51.3	28.1				
17	75 51.3	28.6	40	Kochab	137 16.9	+74 20.1
18	90 51.2	+20 29.0	57	Markab	14 21.0	+14 58.2
19	105 51.2	29.5	8	Menkar	315 00.1	+ 3 55.1
20	120 51.1	30.0	36	Menkent	148 57.7	−36 09.6
21	135 51.1	·· 30.5	24	Miapl'dus	221 49.1	−69 32.7
22	150 51.0	31.0				
23	165 51.0	31.5	9	Mirfak	309 42.2	+49 42.4
			50	Nunki	76 51.0	−26 21.0
23 0	180 50.9	+20 31.9	52	Peacock	54 26.3	−56 52.3
1	195 50.9	32.4	21	Pollux	244 20.2	+28 08.0
2	210 50.8	32.9	20	Procyon	245 44.7	+ 5 20.2
3	225 50.8	·· 33.4				
4	240 50.7	33.9	46	R'alhague	96 45.8	+12 35.4
5	255 50.7	34.3	26	Regulus	208 29.0	+12 10.8
6	270 50.6	+20 34.8	11	Rigel	281 53.5	− 8 15.1
7	285 50.6	35.3	38	Rigil Kent.	140 49.7	−60 39.6
8	300 50.5	35.8	44	Sabik	103 01.3	−15 40.4
9	315 50.5	·· 36.3				
10	330 50.4	36.7	3	Schedar	350 29.7	+56 17.7
11	345 50.4	37.2	45	Shaula	97 19.6	−37 04.4
12	0 50.3	+20 37.7	18	Sirius	259 11.7	−16 39.5
13	15 50.3	38.2	33	Spica	159 16.1	−10 56.2
14	30 50.2	38.6	23	Suhail	223 24.1	−43 15.7
15	45 50.2	·· 39.1				
16	60 50.1	39.6	49	Vega	81 07.6	+38 44.4
17	75 50.1	40.0	39	Zub'g'bi	137 52.5	−15 51.8
18	90 50.0	+20 40.5				
19	105 50.0	41.0				
20	120 49.9	41.5				
21	135 49.9	·· 41.9				
22	150 49.8	42.4				
23	165 49.7	42.9				
24	180 49.7	+20 43.3				
code	—	+ 5				

Lat.	Sunrise	Twlt. begins
N °	h m	h m
72	□	□
70	□	□
68	1 02	////
66	1 54	////
64	2 25	////
62	2 48	////
60	3 07	////
58	3 22	////
56	3 35	////
54	3 46	////
52	3 56	////
50	4 05	1 06
45	4 24	2 10
40	4 39	2 46
35	4 52	3 11
30	5 03	3 31
20	5 22	4 01
10	5 38	4 22
0	5 53	4 40
10	6 08	4 54
20	6 24	5 06
30	6 42	5 17
35	6 53	5 24
40	7 05	5 29
45	7 19	5 35
50	7 36	5 40
52	7 44	5 42
54	7 53	5 44
56	8 03	5 46
58	8 15	5 49
60	8 28	5 52
S		

Moonrise	21	22	23	24
	h m	h m	h m	h m
N 72	19 00	21 53	▬	▬
70	18 30	20 32	▬	▬
68	18 08	19 54	21 43	23 35
66	17 51	19 28	21 01	22 24
64	17 38	19 07	20 33	21 47
62	17 26	18 51	20 11	21 21
60	17 16	18 37	19 54	21 01
58	17 08	18 26	19 39	20 45
56	17 01	18 16	19 27	20 31
54	16 54	18 07	19 16	20 18
52	16 48	17 59	19 06	20 08
50	16 43	17 52	18 58	19 58
45	16 31	17 37	18 40	19 38
40	16 22	17 24	18 25	19 22
35	16 14	17 14	18 12	19 08
30	16 07	17 05	18 02	18 56
20	15 54	16 49	17 43	18 36
10	15 44	16 35	17 27	18 19
0	15 34	16 22	17 12	18 02
10	15 24	16 10	16 57	17 46
20	15 14	15 56	16 41	17 28
30	15 02	15 41	16 23	17 08
35	14 55	15 32	16 12	16 57
40	14 47	15 22	16 00	16 43
45	14 38	15 10	15 46	16 27
50	14 28	14 56	15 29	16 08
52	14 23	14 49	15 21	15 59
54	14 17	14 42	15 12	15 48
56	14 11	14 34	15 01	15 37
58	14 04	14 24	14 50	15 23
60	13 57	14 14	14 37	15 08

Lat.	Sunset	Twlt. ends
N °	h m	h m
72	□	□
70	□	□
68	22 59	////
66	22 03	////
64	21 30	////
62	21 07	////
60	20 48	////
58	20 32	////
56	20 19	////
54	20 08	////
52	19 58	////
50	19 49	22 52
45	19 30	21 46
40	19 15	21 10
35	19 02	20 44
30	18 51	20 24
20	18 32	19 53
10	18 15	19 31
0	18 00	19 13
10	17 45	18 59
20	17 29	18 46
30	17 11	18 35
35	17 01	18 30
40	16 48	18 23
45	16 34	18 18
50	16 17	18 12
52	16 09	18 10
54	16 00	18 07
56	15 50	18 05
58	15 38	18 02
60	15 25	18 00
S		

Moonset	21	22	23	24
	h m	h m	h m	h m
N 72	0 40	{0 13 / 23 02}	▬	▬
70	0 57	0 44	0 24	▬
68	1 11	1 07	1 03	0 58
66	1 23	1 25	1 30	1 40
64	1 32	1 40	1 51	2 09
62	1 40	1 52	2 08	2 31
60	1 48	2 03	2 22	2 48
58	1 54	2 12	2 34	3 03
56	1 59	2 20	2 45	3 16
54	2 04	2 27	2 54	3 27
52	2 09	2 34	3 02	3 37
50	2 13	2 40	3 10	3 46
45	2 22	2 52	3 26	4 05
40	2 30	3 03	3 39	4 20
35	2 36	3 12	3 51	4 33
30	2 42	3 20	4 00	4 44
20	2 52	3 34	4 17	5 03
10	3 01	3 46	4 32	5 20
0	3 09	3 57	4 46	5 36
10	3 17	4 08	5 00	5 52
20	3 26	4 20	5 15	6 09
30	3 36	4 34	5 32	6 28
35	3 42	4 43	5 42	6 40
40	3 49	4 52	5 54	6 53
45	3 56	5 03	6 07	7 08
50	4 06	5 16	6 24	7 27
52	4 10	5 22	6 31	7 36
54	4 15	5 29	6 40	7 46
56	4 20	5 36	6 50	7 58
58	4 26	5 45	7 01	8 11
60	4 33	5 55	7 14	8 26

GMT	Equation of Time (App.—Mean) 21	22	23
h	m s	m s	m s
0	+ 3 32.1	+ 3 28.2	+ 3 23.8
6	+ 3 31.1	+ 3 27.1	+ 3 22.6
12	+ 3 30.2	+ 3 26.1	+ 3 21.4
18	+ 3 29.2	+ 3 24.9	+ 3 20.2
24	+ 3 28.2	+ 3 23.8	+ 3 18.9

GMT of Transit Meridian of Greenwich					
DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
21	21 45	14 35	5 47	17 46	23 53
22	22 34	14 33	5 45	17 43	23 48
23	23 24	14 30	5 44	17 39	23 44
24	24 14	14 27	5 42	17 36	23 40

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.1	0.3	0.2
30	0.1	0.3	0.1
45	0.1	0.2	0.1
60	0.1	0.1	0.1
75	0.1	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	21	22	23
°	′	′	′
0	14.9	14.3	13.6
4	14.9	14.3	13.7
8	14.9	14.3	13.7
12	14.9	14.3	13.7
16	14.9	14.3	13.7
20	15.0	14.4	13.8
24	15.0	14.4	13.8
28	15.0	14.4	13.8
32	15.0	14.4	13.9
36	15.0	14.5	14.0
40	15.0	14.5	14.0
44	15.1	14.6	14.1
48	15.1	14.6	14.2
52	15.1	14.7	14.3
56	15.1	14.7	14.3
60	15.2	14.8	14.4
64	15.2	14.9	14.5
68	15.2	14.9	14.6
72	15.3	15.0	14.7
76	15.3	15.1	14.8
80	15.3	15.1	14.9
84	15.4	15.2	15.0
88	15.4	15.3	15.1
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	21	22	23
°	′	′	′
0	15.9	16.3	16.6
4	15.9	16.3	16.6
8	15.9	16.3	16.6
12	15.9	16.2	16.6
16	15.9	16.2	16.6
20	15.9	16.2	16.5
24	15.9	16.2	16.5
28	15.8	16.1	16.4
32	15.8	16.1	16.4
36	15.8	16.1	16.3
40	15.8	16.0	16.3
44	15.8	16.0	16.2
48	15.7	15.9	16.1
52	15.7	15.9	16.0
56	15.7	15.8	15.9
60	15.6	15.7	15.8
64	15.6	15.7	15.8
68	15.6	15.6	15.7
72	15.6	15.6	15.6
76	15.5	15.5	15.5
80	15.5	15.4	15.4
84	15.4	15.3	15.2
88	15.4	15.3	15.2
90			

Subtract from table, back cover

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G M T	♈ GHA	VENUS −4.2 GHA	Dec.	MARS −0.2 GHA	Dec.	JUPITER −1.6 GHA	Dec.	SATURN 0.2 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
24 0	241 34.0	142 44.7	+26 27.5	274 21.4	−15 42.4	95 26.7	+14 41.8	4 00.2	−17 49.1	8 42.8	107	−20 15.8	− 47
1	256 36.4	157 46.4	27.3	289 22.4	42.0	110 28.9	41.7	19 02.8	49.1	23 12.5	106	20 20.5	− 45
2	271 38.9	172 48.1	27.0	304 23.4	41.6	125 31.1	41.6	34 05.5	49.1	37 42.1	107	20 25.0	− 45
3	286 41.3	187 49.8	·· 26.7	319 24.4	·· 41.2	140 33.3	·· 41.5	49 08.1	·· 49.0	52 11.8	107	·20 29.5	− 44
4	301 43.8	202 51.5	26.5	334 25.4	40.8	155 35.6	41.4	64 10.8	49.0	66 41.5	106	20 33.9	− 42
5	316 46.3	217 53.2	26.2	349 26.4	40.4	170 37.8	41.3	79 13.4	49.0	81 11.1	107	20 38.1	− 42
6	331 48.7	232 55.0	+26 25.9	4 27.4	−15 40.0	185 40.0	+14 41.3	94 16.1	−17 48.9	95 40.8	106	−20 42.3	− 40
7	346 51.2	247 56.7	25.6	19 28.4	39.6	200 42.2	41.2	109 18.7	48.9	110 10.4	106	20 46.3	− 39
8	1 53.7	262 58.4	25.4	34 29.4	39.2	215 44.4	41.1	124 21.4	48.8	124 40.0	107	20 50.2	− 39
9	16 56.1	278 00.2	·· 25.1	49 30.4	·· 38.8	230 46.6	·· 41.0	139 24.1	·· 48.8	139 09.7	106	·20 54.1	− 37
10	31 58.6	293 01.9	24.8	64 31.4	38.4	245 48.9	40.9	154 26.7	48.8	153 39.3	106	20 57.8	− 36
11	47 01.1	308 03.7	24.5	79 32.4	38.0	260 51.1	40.8	169 29.4	48.7	168 08.9	106	21 01.4	− 35
12	62 03.5	323 05.4	+26 24.2	94 33.4	−15 37.6	275 53.3	+14 40.7	184 32.0	−17 48.7	182 38.5	106	−21 04.9	− 34
13	77 06.0	338 07.2	24.0	109 34.4	37.2	290 55.5	40.6	199 34.7	48.7	197 08.1	106	21 08.3	− 33
14	92 08.5	353 08.9	23.7	124 35.4	36.8	305 57.7	40.5	214 37.3	48.6	211 37.7	105	21 11.6	− 32
15	107 10.9	8 10.7	·· 23.4	139 36.4	·· 36.4	320 59.9	·· 40.4	229 40.0	·· 48.6	226 07.2	106	·21 14.8	− 31
16	122 13.4	23 12.4	23.1	154 37.5	36.0	336 02.1	40.4	244 42.6	48.5	240 36.8	106	21 17.9	− 29
17	137 15.8	38 14.2	22.9	169 38.5	35.6	351 04.3	40.3	259 45.3	48.5	255 06.4	106	21 20.8	− 29
18	152 18.3	53 16.0	+26 22.6	184 39.5	−15 35.2	6 06.6	+14 40.2	274 48.0	−17 48.5	269 36.0	105	−21 23.7	− 27
19	167 20.8	68 17.7	22.3	199 40.5	34.8	21 08.8	40.1	289 50.6	48.4	284 05.5	106	21 26.4	− 27
20	182 23.2	83 19.5	22.0	214 41.5	34.4	36 11.0	40.0	304 53.3	48.4	298 35.1	106	21 29.1	− 25
21	197 25.7	98 21.3	·· 21.7	229 42.5	·· 33.9	51 13.2	·· 39.9	319 55.9	·· 48.4	313 04.7	105	·21 31.6	− 24
22	212 28.2	113 23.1	21.4	244 43.5	33.5	66 15.4	39.8	334 58.6	48.3	327 34.2	106	21 34.0	− 24
23	227 30.6	128 24.9	21.2	259 44.5	33.1	81 17.6	39.7	350 01.2	48.3	342 03.8	106	21 36.4	− 22
25 0	242 33.1	143 26.7	+26 20.9	274 45.5	−15 32.7	96 19.8	+14 39.6	5 03.9	−17 48.3	356 33.4	105	−21 38.6	− 21
1	257 35.6	158 28.5	20.6	289 46.5	32.3	111 22.0	39.5	20 06.5	48.2	11 02.9	106	21 40.7	− 20
2	272 38.0	173 30.3	20.3	304 47.5	31.9	126 24.2	39.4	35 09.2	48.2	25 32.5	106	21 42.7	− 18
3	287 40.5	188 32.1	·· 20.0	319 48.5	·· 31.5	141 26.4	·· 39.4	50 11.8	·· 48.1	40 02.1	106	·21 44.5	− 18
4	302 43.0	203 33.9	19.7	334 49.5	31.1	156 28.7	39.3	65 14.5	48.1	54 31.7	106	21 46.3	− 17
5	317 45.4	218 35.7	19.5	349 50.6	30.7	171 30.9	39.2	80 17.2	48.1	69 01.3	106	21 48.0	− 15
6	332 47.9	233 37.5	+26 19.2	4 51.6	−15 30.3	186 33.1	+14 39.1	95 19.8	−17 48.0	83 30.9	106	−21 49.5	− 15
7	347 50.3	248 39.4	18.9	19 52.6	29.9	201 35.3	39.0	110 22.5	48.0	98 00.5	106	21 51.0	− 13
8	2 52.8	263 41.2	18.6	34 53.6	29.5	216 37.5	38.9	125 25.1	48.0	112 30.1	106	21 52.3	− 12
9	17 55.3	278 43.0	·· 18.3	49 54.6	·· 29.1	231 39.7	·· 38.8	140 27.8	·· 47.9	126 59.7	107	·21 53.5	− 11
10	32 57.7	293 44.8	18.0	64 55.6	28.7	246 41.9	38.7	155 30.4	47.9	141 29.4	106	21 54.6	− 10
11	48 00.2	308 46.7	17.7	79 56.6	28.3	261 44.1	38.6	170 33.1	47.8	155 59.0	106	21 55.6	− 9
12	63 02.7	323 48.5	+26 17.4	94 57.6	−15 27.9	276 46.3	+14 38.5	185 35.7	−17 47.8	170 28.6	107	−21 56.5	− 8
13	78 05.1	338 50.4	17.1	109 58.6	27.5	291 48.5	38.4	200 38.4	47.8	184 58.3	107	21 57.3	− 7
14	93 07.6	353 52.2	16.9	124 59.7	27.1	306 50.7	38.3	215 41.0	47.7	199 28.0	107	21 58.0	− 6
15	108 10.1	8 54.1	·· 16.6	140 00.7	·· 26.7	321 53.0	·· 38.2	230 43.7	·· 47.7	213 57.7	107	·21 58.6	− 4
16	123 12.5	23 55.9	16.3	155 01.7	26.3	336 55.2	38.2	245 46.4	47.7	228 27.4	107	21 59.0	− 4
17	138 15.0	38 57.8	16.0	170 02.7	25.9	351 57.4	38.1	260 49.0	47.6	242 57.1	107	21 59.4	− 2
18	153 17.5	53 59.7	+26 15.7	185 03.7	−15 25.5	6 59.6	+14 38.0	275 51.7	−17 47.6	257 26.8	108	−21 59.6	− 2
19	168 19.9	69 01.5	15.4	200 04.7	25.1	22 01.8	37.9	290 54.3	47.6	271 56.6	107	21 59.8	0
20	183 22.4	84 03.4	15.1	215 05.7	24.7	37 04.0	37.8	305 57.0	47.5	286 26.3	108	21 59.8	+ 1
21	198 24.8	99 05.3	·· 14.8	230 06.7	·· 24.3	52 06.2	·· 37.7	320 59.6	·· 47.5	300 56.1	108	·21 59.7	+ 2
22	213 27.3	114 07.2	14.5	245 07.8	23.9	67 08.4	37.6	336 02.3	47.4	315 25.9	108	21 59.5	+ 3
23	228 29.8	129 09.1	14.2	260 08.8	23.5	82 10.6	37.5	351 04.9	47.4	329 55.7	109	21 59.2	+ 4
26 0	243 32.2	144 11.0	+26 13.9	275 09.8	−15 23.1	97 12.8	+14 37.4	6 07.6	−17 47.4	344 25.6	108	−21 58.8	+ 5
1	258 34.7	159 12.9	13.6	290 10.8	22.7	112 15.0	37.3	21 10.2	47.3	358 55.4	109	21 58.3	+ 6
2	273 37.2	174 14.8	13.3	305 11.8	22.3	127 17.2	37.2	36 12.9	47.3	13 25.3	109	21 57.7	+ 7
3	288 39.6	189 16.7	·· 13.0	320 12.8	·· 21.9	142 19.4	·· 37.1	51 15.6	·· 47.3	27 55.2	109	·21 57.0	+ 9
4	303 42.1	204 18.6	12.7	335 13.9	21.5	157 21.6	37.0	66 18.2	47.2	42 25.1	109	21 56.1	+ 9
5	318 44.6	219 20.5	12.4	350 14.9	21.1	172 23.8	36.9	81 20.9	47.2	56 55.0	110	21 55.2	+ 11
6	333 47.0	234 22.4	+26 12.1	5 15.9	−15 20.7	187 26.0	+14 36.9	96 23.5	−17 47.2	71 25.0	110	−21 54.1	+ 11
7	348 49.5	249 24.3	11.8	20 16.9	20.3	202 28.2	36.8	111 26.2	47.1	85 55.0	110	21 53.0	+ 13
8	3 52.0	264 26.2	11.5	35 17.9	19.9	217 30.4	36.7	126 28.8	47.1	100 25.0	111	21 51.7	+ 13
9	18 54.4	279 28.2	·· 11.2	50 18.9	·· 19.5	232 32.6	·· 36.6	141 31.5	·· 47.0	114 55.1	110	·21 50.4	+ 15
10	33 56.9	294 30.1	10.9	65 20.0	19.1	247 34.8	36.5	156 34.1	47.0	129 25.1	111	21 48.9	+ 16
11	48 59.3	309 32.0	10.6	80 21.0	18.7	262 37.0	36.4	171 36.8	47.0	143 55.2	111	21 47.3	+ 16
12	64 01.8	324 34.0	+26 10.3	95 22.0	−15 18.3	277 39.2	+14 36.3	186 39.4	−17 46.9	158 25.3	112	−21 45.7	+ 18
13	79 04.3	339 35.9	10.0	110 23.0	17.9	292 41.4	36.2	201 42.1	46.9	172 55.5	112	21 43.9	+ 19
14	94 06.7	354 37.9	09.7	125 24.0	17.5	307 43.6	36.1	216 44.8	46.9	187 25.7	112	21 42.0	+ 20
15	109 09.2	9 39.8	·· 09.4	140 25.1	·· 17.1	322 45.8	·· 36.0	231 47.4	·· 46.8	201 55.9	112	·21 40.0	+ 21
16	124 11.7	24 41.8	09.1	155 26.1	16.7	337 48.0	35.9	246 50.1	46.8	216 26.1	113	21 37.9	+ 21
17	139 14.1	39 43.8	08.8	170 27.1	16.3	352 50.3	35.8	261 52.7	46.7	230 56.4	113	21 35.8	+ 23
18	154 16.6	54 45.7	+26 08.5	185 28.1	−15 15.9	7 52.5	+14 35.7	276 55.4	−17 46.7	245 26.7	113	−21 33.5	+ 24
19	169 19.1	69 47.7	08.2	200 29.1	15.5	22 54.7	35.6	291 58.0	46.7	259 57.0	113	21 31.1	+ 25
20	184 21.5	84 49.7	07.9	215 30.2	15.1	37 56.9	35.5	307 00.7	46.6	274 27.3	114	21 28.6	+ 26
21	199 24.0	99 51.6	·· 07.6	230 31.2	·· 14.7	52 59.1	·· 35.4	322 03.3	·· 46.6	288 57.7	115	·21 26.0	+ 27
22	214 26.4	114 53.6	07.3	245 32.2	14.3	68 01.3	35.3	337 06.0	46.6	303 28.2	114	21 23.3	+ 28
23	229 28.9	129 55.6	07.0	260 33.2	13.9	83 03.5	35.3	352 08.6	46.5	317 58.6	115	21 20.5	+ 29
24	244 31.4	144 57.6	+26 06.7	275 34.3	−15 13.5	98 05.7	+14 35.2	7 11.3	−17 46.5	332 29.1	115	−21 17.6	+ 30
code	—	+ 19	− 3	+ 10	+ 4	+ 22	− 1	+ 27	0				

GMT h	SUN GHA ° ′	SUN Dec. ° ′	STARS No.	Name	SHA ° ′	Dec. ° ′
24 0	180 49.7	+20 43.3	7	Acamar	315 51.2	−40 28.6
1	195 49.6	43.8	5	Achernar	335 59.0	−57 27.2
2	210 49.6	44.3	30	Acrux	173 56.8	−62 51.8
3	225 49.5	44.7	19	Adhara	255 46.4	−28 54.9
4	240 49.5	45.2	10	Aldebaran	291 38.9	+16 25.3
5	255 49.4	45.7				
6	270 49.4	+20 46.1	32	Alioth	166 57.8	+56 11.9
7	285 49.3	46.6	34	Alkaid	153 32.1	+49 31.9
8	300 49.3	47.0	55	Al Na'ir	28 37.3	−47 10.1
9	315 49.2	47.5	15	Alnilam	276 30.1	− 1 13.8
10	330 49.1	48.0	25	Alphard	218 38.2	− 8 28.3
11	345 49.1	48.4				
12	0 49.0	+20 48.9	41	Alphecca	126 46.9	+26 51.6
13	15 49.0	49.3	1	Alpheratz	358 28.0	+28 50.9
14	30 48.9	49.8	51	Altair	62 49.7	+ 8 45.1
15	45 48.9	50.3	2	Ankaa	353 58.1	−42 32.3
16	60 48.8	50.7	42	Antares	113 18.4	−26 20.3
17	75 48.7	51.2				
18	90 48.7	+20 51.6	37	Arcturus	146 34.4	+19 24.5
19	105 48.6	52.1	43	Atria	108 58.1	−68 57.0
20	120 48.6	52.5	22	Avior	234 35.9	−59 22.5
21	135 48.5	53.0	13	Bellatrix	279 18.2	+ 6 18.6
22	150 48.5	53.5	16	Betelg'se	271 47.9	+ 7 23.9
23	165 48.4	53.9				
			17	Canopus	264 15.6	−52 40.5
25 0	180 48.3	+20 54.4	12	Capella	281 38.2	+45 57.3
1	195 48.3	54.8	53	Deneb	50 00.4	+45 07.3
2	210 48.2	55.3	28	Denebola	183 17.1	+14 48.9
3	225 48.2	55.7	4	Diphda	349 39.0	−18 13.4
4	240 48.1	56.2				
5	255 48.0	56.6	27	Dubhe	194 43.9	+61 59.4
6	270 48.0	+20 57.1	14	Elnath	279 07.1	+28 34.3
7	285 47.9	57.5	47	Eltanin	91 05.5	+51 29.5
8	300 47.9	58.0	54	Enif	34 29.0	+ 9 40.5
9	315 47.8	58.4	56	Fomalhaut	16 11.1	−29 51.0
10	330 47.7	58.8				
11	345 47.7	59.3	31	Gacrux	172 48.3	−56 52.5
12	0 47.6	+20 59.7	29	Gienah	176 36.2	−17 18.2
13	15 47.6	21 00.2	35	Hadar	149 48.1	−60 10.1
14	30 47.5	00.6	6	Hamal	328 49.4	+23 15.4
15	45 47.4	01.1	48	Kaus Aust.	84 40.2	−34 24.3
16	60 47.4	01.5				
17	75 47.3	02.0	40	Kochab	137 16.9	+74 20.1
18	90 47.2	+21 02.4	57	Markab	14 21.0	+14 58.2
19	105 47.2	02.8	8	Menkar	315 00.1	+ 3 55.2
20	120 47.1	03.3	36	Menkent	148 57.7	−36 09.6
21	135 47.1	03.7	24	Miapl'dus	221 49.2	−69 32.7
22	150 47.0	04.2				
23	165 46.9	04.6	9	Mirfak	309 42.2	+49 42.4
			50	Nunki	76 51.0	−26 21.0
26 0	180 46.9	+21 05.0	52	Peacock	54 26.2	−56 52.3
1	195 46.8	05.5	21	Pollux	244 20.2	+28 08.0
2	210 46.7	05.9	20	Procyon	245 44.7	+ 5 20.2
3	225 46.7	06.3				
4	240 46.6	06.8	46	R'alhague	96 45.8	+12 35.4
5	255 46.5	07.2	26	Regulus	208 29.0	+12 10.8
6	270 46.5	+21 07.6	11	Rigel	281 53.5	− 8 15.1
7	285 46.4	08.1	38	Rigil Kent.	140 49.7	−60 39.6
8	300 46.3	08.5	44	Sabik	103 01.3	−15 40.4
9	315 46.3	08.9				
10	330 46.2	09.4	3	Schedar	350 29.7	+56 17.7
11	345 46.1	09.8	45	Shaula	97 19.6	−37 04.4
12	0 46.1	+21 10.2	18	Sirius	259 11.7	−16 39.5
13	15 46.0	10.7	33	Spica	159 16.1	−10 56.2
14	30 45.9	11.1	23	Suhail	223 24.1	−43 15.7
15	45 45.9	11.5				
16	60 45.8	11.9	49	Vega	81 07.6	+38 44.4
17	75 45.7	12.4	39	Zub'g'bi	137 52.5	−15 51.8
18	90 45.7	+21 12.8				
19	105 45.6	13.2				
20	120 45.5	13.6				
21	135 45.5	14.1				
22	150 45.4	14.5				
23	165 45.3	14.9				
24	180 45.3	+21 15.3				
code	—	+ 5				

Lat. N °	Sunrise h m	Twlt. begins h m	Moonrise 24 h m	25 h m	26 h m	27 h m
72	□	□	▬	▬	▬	▬
70	□	□	▬	▬	▬	▬
68	0 33	////	23 35	▬	▬	0 53
66	1 41	////	22 24	23 24	23 56	24 12
64	2 16	////	21 47	22 45	23 23	23 46
62	2 41	////	21 21	22 18	22 59	23 26
60	3 01	////	21 01	21 57	22 39	23 10
58	3 17	////	20 45	21 40	22 23	22 56
56	3 31	////	20 31	21 25	22 09	22 44
54	3 42	////	20 18	21 13	21 57	22 33
52	3 53	////	20 08	21 02	21 47	22 24
50	4 02	0 54	19 58	20 52	21 38	22 16
45	4 21	2 04	19 38	20 31	21 18	21 58
40	4 37	2 43	19 22	20 15	21 02	21 43
35	4 50	3 09	19 08	20 00	20 48	21 31
30	5 02	3 29	18 56	19 48	20 36	21 20
20	5 21	3 59	18 36	19 27	20 16	21 02
10	5 38	4 22	18 19	19 09	19 58	20 45
0	5 53	4 39	18 02	18 52	19 42	20 30
10	6 09	4 54	17 46	18 36	19 26	20 15
20	6 25	5 08	17 28	18 18	19 08	19 59
30	6 44	5 19	17 08	17 57	18 48	19 40
35	6 54	5 25	16 57	17 45	18 36	19 29
40	7 07	5 31	16 43	17 31	18 22	19 17
45	7 21	5 36	16 27	17 14	18 06	19 02
50	7 39	5 42	16 08	16 54	17 46	18 44
52	7 48	5 45	15 59	16 44	17 37	18 35
54	7 57	5 48	15 48	16 33	17 26	18 26
56	8 08	5 50	15 37	16 21	17 14	18 15
58	8 20	5 53	15 23	16 06	17 00	18 02
60	8 34	5 56	15 08	15 49	16 44	17 48
S						

Lat. N °	Sunset h m	Twlt. ends h m	Moonset 24 h m	25 h m	26 h m	27 h m
72	□	□	▬	▬	▬	▬
70	□	□	▬	▬	▬	▬
68	23 38	////	0 58	0 50	▬	3 00
66	22 16	////	1 40	2 02	2 46	3 56
64	21 40	////	2 09	2 38	3 25	4 29
62	21 14	////	2 31	3 04	3 52	4 53
60	20 54	////	2 48	3 25	4 13	5 12
58	20 38	////	3 03	3 41	4 30	5 28
56	20 24	////	3 16	3 56	4 44	5 42
54	20 12	////	3 27	4 08	4 57	5 53
52	20 02	////	3 37	4 19	5 08	6 04
50	19 53	23 06	3 46	4 28	5 18	6 13
45	19 33	21 51	4 05	4 49	5 38	6 32
40	19 17	21 13	4 20	5 05	5 55	6 48
35	19 04	20 46	4 33	5 19	6 09	7 01
30	18 53	20 26	4 44	5 31	6 21	7 13
20	18 33	19 55	5 03	5 52	6 42	7 32
10	18 16	19 32	5 20	6 10	7 00	7 50
0	18 00	19 14	5 36	6 26	7 16	8 06
10	17 45	18 59	5 52	6 43	7 33	8 21
20	17 29	18 46	6 09	7 01	7 51	8 38
30	17 10	18 34	6 28	7 22	8 12	8 58
35	16 59	18 28	6 40	7 34	8 24	9 09
40	16 46	18 22	6 53	7 48	8 38	9 22
45	16 32	18 16	7 08	8 04	8 54	9 37
50	16 14	18 10	7 27	8 24	9 14	9 56
52	16 06	18 08	7 36	8 34	9 24	10 05
54	15 56	18 04	7 46	8 45	9 34	10 15
56	15 46	18 02	7 58	8 57	9 47	10 26
58	15 33	17 59	8 11	9 12	10 01	10 39
60	15 19	17 56	8 26	9 28	10 17	10 53
S						

GMT h	Equation of Time (App. Mean) 24 m s	25 m s	26 m s
0	+ 3 18.9	+ 3 13.5	+ 3 07.6
6	+ 3 17.6	+ 3 12.0	+ 3 06.0
12	+ 3 16.2	+ 3 10.6	+ 3 04.4
18	+ 3 14.9	+ 3 09.1	+ 3 02.8
24	+ 3 13.5	+ 3 07.6	+ 3 01.2

DAY	GMT of Transit Meridian of Greenwich Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
24	24 14	14 27	5 42	17 36	23 40
25	0 14	14 25	5 41	17 32	23 36
26	1 05	14 21	5 39	17 29	23 31
27	1 54	14 18	5 37	17 25	23 27

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.1	0.4	0.2
30	0.1	0.3	0.1
45	0.1	0.2	0.1
60	0.1	0.1	0.1
75	0.1	0.0	0.0
90			

Moon's Lower Limb Add

Alt. °	24 ′	25 ′	26 ′
0	13.1	12.6	12.2
4	13.1	12.6	12.3
8	13.2	12.7	12.3
12	13.2	12.7	12.3
16	13.2	12.7	12.4
20	13.3	12.8	12.4
24	13.3	12.9	12.5
28	13.4	12.9	12.6
32	13.5	13.0	12.7
36	13.5	13.1	12.8
40	13.6	13.2	12.9
44	13.7	13.3	13.0
48	13.8	13.4	13.2
52	13.9	13.6	13.3
56	14.0	13.7	13.5
60	14.1	13.8	13.6
64	14.3	14.0	13.8
68	14.4	14.1	14.0
72	14.5	14.3	14.1
76	14.6	14.4	14.3
80	14.8	14.6	14.5
84	14.9	14.8	14.7
88	15.0	14.9	14.8
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt. °	24 ′	25 ′	26 ′
0	16.9	17.2	17.4
4	16.9	17.2	17.4
8	16.9	17.2	17.4
12	16.9	17.2	17.4
16	16.8	17.1	17.3
20	16.8	17.1	17.3
24	16.7	17.0	17.2
28	16.7	16.9	17.1
32	16.6	16.8	17.0
36	16.5	16.7	16.9
40	16.4	16.6	16.8
44	16.4	16.5	16.6
48	16.3	16.4	16.5
52	16.2	16.3	16.4
56	16.0	16.1	16.2
60	15.9	16.0	16.1
64	15.8	15.9	15.9
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.3	15.2	15.2
84	15.2	15.1	15.0
88	15.1	15.0	14.9
90			

Subtract from table, back cover

Full Moon 24

GMT	♈ GHA	VENUS −4.2 GHA	VENUS −4.2 Dec.	MARS −0.2 GHA	MARS −0.2 Dec.	JUPITER −1.6 GHA	JUPITER −1.6 Dec.	SATURN 0.3 GHA	SATURN 0.3 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
27 0	244 31.4	144 57.6	+26 06.7	275 34.3	−15 13.5	98 05.7	+14 35.2	7 11.3	−17 46.5	332 29.1	115	−21 17.6	+ 30
1	259 33.8	159 59.6	06.4	290 35.3	13.1	113 07.8	35.1	22 13.9	46.5	346 59.6	116	21 14.6	+ 31
2	274 36.3	175 01.6	06.1	305 36.3	12.6	128 10.0	35.0	37 16.6	46.4	1 30.2	116	21 11.5	+ 32
3	289 38.8	190 03.6	·· 05.7	320 37.3	·· 12.2	143 12.2	·· 34.9	52 19.3	·· 46.4	16 00.8	116	·21 08.3	+ 33
4	304 41.2	205 05.6	05.4	335 38.4	11.8	158 14.4	34.8	67 21.9	46.3	30 31.4	117	21 05.0	+ 34
5	319 43.7	220 07.6	05.1	350 39.4	11.4	173 16.6	34.7	82 24.6	46.3	45 02.1	117	21 01.6	+ 35
6	334 46.2	235 09.6	+26 04.8	5 40.4	−15 11.0	188 18.8	+14 34.6	97 27.2	−17 46.3	59 32.8	117	−20 58.1	+ 35
7	349 48.6	250 11.7	04.5	20 41.4	10.6	203 21.0	34.5	112 29.9	46.2	74 03.5	118	20 54.6	+ 37
8	4 51.1	265 13.7	04.2	35 42.5	10.2	218 23.2	34.4	127 32.5	46.2	88 34.3	118	20 50.9	+ 38
9	19 53.6	280 15.7	·· 03.9	50 43.5	·· 09.8	233 25.4	·· 34.3	142 35.2	·· 46.2	103 05.1	119	·20 47.1	+ 39
10	34 56.0	295 17.7	03.6	65 44.5	09.4	248 27.6	34.2	157 37.8	46.1	117 36.0	119	20 43.2	+ 39
11	49 58.5	310 19.8	03.3	80 45.5	09.0	263 29.8	34.1	172 40.5	46.1	132 06.9	119	20 39.3	+ 41
12	65 00.9	325 21.8	+26 02.9	95 46.6	−15 08.6	278 32.0	+14 34.0	187 43.1	−17 46.1	146 37.8	119	−20 35.2	+ 41
13	80 03.4	340 23.9	02.6	110 47.6	08.2	293 34.2	33.9	202 45.8	46.0	161 08.7	121	20 31.1	+ 43
14	95 05.9	355 25.9	02.3	125 48.6	07.8	308 36.4	33.8	217 48.4	46.0	175 39.8	120	20 26.8	+ 43
15	110 08.3	10 28.0	·· 02.0	140 49.6	·· 07.4	323 38.6	·· 33.7	232 51.1	·· 45.9	190 10.8	121	·20 22.5	+ 45
16	125 10.8	25 30.0	01.7	155 50.7	07.0	338 40.8	33.6	247 53.8	45.9	204 41.9	121	20 18.0	+ 45
17	140 13.3	40 32.1	01.4	170 51.7	06.6	353 43.0	33.5	262 56.4	45.9	219 13.0	122	20 13.5	+ 46
18	155 15.7	55 34.2	+26 01.1	185 52.7	−15 06.2	8 45.2	+14 33.4	277 59.1	−17 45.8	233 44.2	122	−20 08.9	+ 47
19	170 18.2	70 36.2	00.7	200 53.8	05.8	23 47.4	33.3	293 01.7	45.8	248 15.4	122	20 04.2	+ 48
20	185 20.7	85 38.3	00.4	215 54.8	05.4	38 49.6	33.2	308 04.4	45.8	262 46.6	123	19 59.4	+ 49
21	200 23.1	100 40.4	·26 00.1	230 55.8	·· 05.0	53 51.8	·· 33.1	323 07.0	·· 45.7	277 17.9	123	·19 54.5	+ 50
22	215 25.6	115 42.5	25 59.8	245 56.9	04.6	68 54.0	33.0	338 09.7	45.7	291 49.2	124	19 49.5	+ 50
23	230 28.1	130 44.6	59.5	260 57.9	04.2	83 56.2	32.9	353 12.3	45.7	306 20.6	124	19 44.5	+ 52
28 0	245 30.5	145 46.7	+25 59.1	275 58.9	−15 03.8	98 58.4	+14 32.9	8 15.0	−17 45.6	320 52.0	125	−19 39.3	+ 52
1	260 33.0	160 48.8	58.8	290 59.9	03.4	114 00.6	32.8	23 17.6	45.6	335 23.5	125	19 34.1	+ 53
2	275 35.4	175 50.8	58.5	306 01.0	03.0	129 02.8	32.7	38 20.3	45.5	349 55.0	125	19 28.8	+ 54
3	290 37.9	190 53.0	·· 58.2	321 02.0	·· 02.6	144 04.9	·· 32.6	53 22.9	·· 45.5	4 26.5	126	·19 23.4	+ 55
4	305 40.4	205 55.1	57.9	336 03.0	02.2	159 07.1	32.5	68 25.6	45.5	18 58.1	126	19 17.9	+ 56
5	320 42.8	220 57.2	57.5	351 04.1	01.8	174 09.3	32.4	83 28.3	45.4	33 29.7	126	19 12.3	+ 57
6	335 45.3	235 59.3	+25 57.2	6 05.1	−15 01.4	189 11.5	+14 32.3	98 30.9	−17 45.4	48 01.3	127	−19 06.6	+ 57
7	350 47.8	251 01.4	56.9	21 06.1	01.0	204 13.7	32.2	113 33.6	45.4	62 33.0	128	19 00.9	+ 59
8	5 50.2	266 03.5	56.6	36 07.2	00.6	219 15.9	32.1	128 36.2	45.3	77 04.8	128	18 55.0	+ 59
9	20 52.7	281 05.7	·· 56.2	51 08.2	·15 00.2	234 18.1	·· 32.0	143 38.9	·· 45.3	91 36.6	128	·18 49.1	+ 60
10	35 55.2	296 07.8	55.9	66 09.2	14 59.8	249 20.3	31.9	158 41.5	45.3	106 08.4	129	18 43.1	+ 61
11	50 57.6	311 09.9	55.6	81 10.3	59.4	264 22.5	31.8	173 44.2	45.2	120 40.3	129	18 37.0	+ 61
12	66 00.1	326 12.1	+25 55.3	96 11.3	−14 59.0	279 24.7	+14 31.7	188 46.8	−17 45.2	135 12.2	129	−18 30.9	+ 63
13	81 02.5	341 14.2	54.9	111 12.3	58.6	294 26.9	31.6	203 49.5	45.2	149 44.1	130	18 24.6	+ 63
14	96 05.0	356 16.4	54.6	126 13.4	58.2	309 29.1	31.5	218 52.1	45.1	164 16.1	131	18 18.3	+ 64
15	111 07.5	11 18.6	·· 54.3	141 14.4	·· 57.8	324 31.3	·· 31.4	233 54.8	·· 45.1	178 48.2	130	·18 11.9	+ 65
16	126 09.9	26 20.7	54.0	156 15.5	57.4	339 33.4	31.3	248 57.4	45.0	193 20.2	132	18 05.4	+ 65
17	141 12.4	41 22.9	53.6	171 16.5	57.0	354 35.6	31.2	264 00.1	45.0	207 52.4	131	17 58.9	+ 67
18	156 14.9	56 25.0	+25 53.3	186 17.5	−14 56.6	9 37.8	+14 31.1	279 02.7	−17 45.0	222 24.5	132	−17 52.2	+ 67
19	171 17.3	71 27.2	53.0	201 18.6	56.2	24 40.0	31.0	294 05.4	44.9	236 56.7	133	17 45.5	+ 68
20	186 19.8	86 29.4	52.6	216 19.6	55.8	39 42.2	30.9	309 08.0	44.9	251 29.0	132	17 38.7	+ 68
21	201 22.3	101 31.6	·· 52.3	231 20.6	·· 55.3	54 44.4	·· 30.8	324 10.7	·· 44.9	266 01.2	134	·17 31.9	+ 70
22	216 24.7	116 33.8	52.0	246 21.7	54.9	69 46.6	30.7	339 13.4	44.8	280 33.6	133	17 24.9	+ 70
23	231 27.2	131 36.0	51.7	261 22.7	54.5	84 48.8	30.6	354 16.0	44.8	295 05.9	134	17 17.9	+ 71
29 0	246 29.7	146 38.2	+25 51.3	276 23.8	−14 54.1	99 51.0	+14 30.5	9 18.7	−17 44.8	309 38.3	135	−17 10.8	+ 72
1	261 32.1	161 40.4	51.0	291 24.8	53.7	114 53.1	30.4	24 21.3	44.7	324 10.8	135	17 03.6	+ 72
2	276 34.6	176 42.6	50.7	306 25.8	53.3	129 55.3	30.3	39 24.0	44.7	338 43.3	135	16 56.4	+ 73
3	291 37.0	191 44.8	·· 50.3	321 26.9	·· 52.9	144 57.5	·· 30.2	54 26.6	·· 44.6	353 15.8	136	·16 49.1	+ 74
4	306 39.5	206 47.0	50.0	336 27.9	52.5	159 59.7	30.1	69 29.3	44.6	7 48.4	136	16 41.7	+ 75
5	321 42.0	221 49.2	49.7	351 29.0	52.1	175 01.9	30.0	84 31.9	44.6	22 21.0	136	16 34.2	+ 75
6	336 44.4	236 51.4	+25 49.3	6 30.0	−14 51.7	190 04.1	+14 29.9	99 34.6	−17 44.5	36 53.6	137	−16 26.7	+ 76
7	351 46.9	251 53.7	49.0	21 31.0	51.3	205 06.3	29.8	114 37.2	44.5	51 26.3	137	16 19.1	+ 76
8	6 49.4	266 55.9	48.7	36 32.1	50.9	220 08.5	29.7	129 39.9	44.5	65 59.0	138	16 11.5	+ 78
9	21 51.8	281 58.1	·· 48.3	51 33.1	·· 50.5	235 10.6	·· 29.6	144 42.5	·· 44.4	80 31.8	138	·16 03.7	+ 78
10	36 54.3	297 00.4	48.0	66 34.2	50.1	250 12.8	29.5	159 45.2	44.4	95 04.6	138	15 55.9	+ 78
11	51 56.8	312 02.6	47.6	81 35.2	49.7	265 15.0	29.4	174 47.8	44.4	109 37.4	139	15 48.1	+ 80
12	66 59.2	327 04.8	+25 47.3	96 36.3	−14 49.3	280 17.2	+14 29.3	189 50.5	−17 44.3	124 10.3	139	−15 40.1	+ 80
13	82 01.7	342 07.1	47.0	111 37.3	48.9	295 19.4	29.2	204 53.1	44.3	138 43.2	139	15 32.1	+ 80
14	97 04.2	357 09.4	46.6	126 38.3	48.5	310 21.6	29.1	219 55.8	44.3	153 16.1	140	15 24.1	+ 82
15	112 06.6	12 11.6	·· 46.3	141 39.4	·· 48.1	325 23.8	·· 29.0	234 58.4	·· 44.2	167 49.1	140	·15 15.9	+ 82
16	127 09.1	27 13.9	46.0	156 40.4	47.7	340 25.9	28.9	250 01.1	44.2	182 22.1	141	15 07.7	+ 82
17	142 11.5	42 16.2	45.6	171 41.5	47.3	355 28.1	28.8	265 03.7	44.1	196 55.2	141	14 59.5	+ 84
18	157 14.0	57 18.4	+25 45.3	186 42.5	−14 46.9	10 30.3	+14 28.7	280 06.4	−17 44.1	211 28.3	141	−14 51.1	+ 84
19	172 16.5	72 20.7	44.9	201 43.6	46.5	25 32.5	28.6	295 09.0	44.1	226 01.4	142	14 42.7	+ 84
20	187 18.9	87 23.0	44.6	216 44.6	46.1	40 34.7	28.5	310 11.7	44.0	240 34.6	142	14 34.3	+ 85
21	202 21.4	102 25.3	·· 44.2	231 45.7	·· 45.7	55 36.9	·· 28.4	325 14.4	·· 44.0	255 07.8	142	·14 25.8	+ 86
22	217 23.9	117 27.6	43.9	246 46.7	45.3	70 39.0	28.3	340 17.0	44.0	269 41.0	142	14 17.2	+ 86
23	232 26.3	132 29.9	43.6	261 47.7	44.9	85 41.2	28.2	355 19.7	43.9	284 14.2	143	14 08.6	+ 87
24	247 28.8	147 32.2	+25 43.2	276 48.8	−14 44.5	100 43.4	+14 28.1	10 22.3	−17 43.9	298 47.5	144	−13 59.9	+ 88
code	−	+ 21	− 4	+ 10	+ 4	+ 22	− 1	+ 27	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
27 0	180 45.3	+21 15.3
1	195 45.2	15.8
2	210 45.1	16.2
3	225 45.0	·· 16.6
4	240 45.0	17.0
5	255 44.9	17.4
6	270 44.8	+21 17.9
7	285 44.8	18.3
8	300 44.7	18.7
9	315 44.6	·· 19.1
10	330 44.6	19.5
11	345 44.5	19.9
12	0 44.4	+21 20.4
13	15 44.3	20.8
14	30 44.3	21.2
15	45 44.2	·· 21.6
16	60 44.1	22.0
17	75 44.0	22.4
18	90 44.0	+21 22.8
19	105 43.9	23.2
20	120 43.8	23.6
21	135 43.8	·· 24.1
22	150 43.7	24.5
23	165 43.6	24.9
28 0	180 43.5	+21 25.3
1	195 43.5	25.7
2	210 43.4	26.1
3	225 43.3	·· 26.5
4	240 43.2	26.9
5	255 43.2	27.3
6	270 43.1	+21 27.7
7	285 43.0	28.1
8	300 42.9	28.5
9	315 42.9	·· 28.9
10	330 42.8	29.3
11	345 42.7	29.7
12	0 42.6	+21 30.1
13	15 42.5	30.5
14	30 42.5	30.9
15	45 42.4	·· 31.3
16	60 42.3	31.7
17	75 42.2	32.1
18	90 42.2	+21 32.5
19	105 42.1	32.9
20	120 42.0	33.3
21	135 41.9	·· 33.7
22	150 41.8	34.1
23	165 41.8	34.5
29 0	180 41.7	+21 34.8
1	195 41.6	35.2
2	210 41.5	35.6
3	225 41.4	·· 36.0
4	240 41.4	36.4
5	255 41.3	36.8
6	270 41.2	+21 37.2
7	285 41.1	37.6
8	300 41.0	38.0
9	315 41.0	·· 38.3
10	330 40.9	38.7
11	345 40.8	39.1
12	0 40.7	+21 39.5
13	15 40.6	39.9
14	30 40.6	40.3
15	45 40.5	·· 40.6
16	60 40.4	41.0
17	75 40.3	41.4
18	90 40.2	+21 41.8
19	105 40.1	42.2
20	120 40.1	42.5
21	135 40.0	·· 42.9
22	150 39.9	43.3
23	165 39.8	43.7
24	180 39.7	+21 44.0
code	—	+ 4

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.2	−40 28.6
5	Achernar	335 59.0	−57 27.2
30	Acrux	173 56.9	−62 51.9
19	Adhara	255 46.5	−28 54.9
10	Aldebaran	291 38.8	+16 25.3
32	Alioth	166 57.8	+56 11.9
34	Alkaid	153 32.1	+49 31.9
55	Al Na'ir	28 37.3	−47 10.1
15	Alnilam	276 30.1	− 1 13.8
25	Alphard	218 38.2	− 8 28.3
41	Alphecca	126 46.9	+26 51.6
1	Alpheratz	358 27.9	+28 50.9
51	Altair	62 49.7	+ 8 45.1
2	Ankaa	353 58.0	−42 32.3
42	Antares	113 18.4	−26 20.3
37	Arcturus	146 34.4	+19 24.5
43	Atria	108 58.1	−68 57.0
22	Avior	234 35.9	−59 22.5
13	Bellatrix	279 18.2	+ 6 18.6
16	Betelg'se	271 47.9	+ 7 23.9
17	Canopus	264 15.6	−52 40.5
12	Capella	281 38.2	+45 57.3
53	Deneb	50 00.4	+45 07.3
28	Denebola	183 17.1	+14 48.9
4	Diphda	349 38.9	−18 13.4
27	Dubhe	194 44.0	+61 59.4
14	Elnath	279 07.1	+28 34.3
47	Eltanin	91 05.5	+51 29.5
54	Enif	34 29.0	+ 9 40.5
56	Fomalhaut	16 11.1	−29 51.0
31	Gacrux	172 48.4	−56 52.5
29	Gienah	176 36.2	−17 18.2
35	Hadar	149 48.1	−60 10.1
6	Hamal	328 49.4	+23 15.4
48	Kaus Aust.	84 40.2	−34 24.3
40	Kochab	137 16.9	+74 20.1
57	Markab	14 21.0	+14 58.2
8	Menkar	315 00.1	+ 3 55.2
36	Menkent	148 57.7	−36 09.6
24	Miapl'dus	221 49.2	−69 32.7
9	Mirfak	309 42.1	+49 42.4
50	Nunki	76 51.0	−26 21.0
52	Peacock	54 26.2	−56 52.3
21	Pollux	244 20.2	+28 08.0
20	Procyon	245 44.7	+ 5 20.2
46	R'alhague	96 45.8	+12 35.4
26	Regulus	208 29.0	+12 10.8
11	Rigel	281 53.5	− 8 15.1
38	Rigil Kent.	140 49.7	−60 39.6
44	Sabik	103 01.3	−15 40.4
3	Schedar	350 29.7	+56 17.7
45	Shaula	97 19.6	−37 04.4
18	Sirius	259 11.7	−16 39.5
33	Spica	159 16.1	−10 56.2
23	Suhail	223 24.1	−43 15.7
49	Vega	81 07.5	+38 44.5
39	Zub'g'bi	137 52.5	−15 51.8

GMT	Equation of Time (App. Mean) 27	28	29
h	m s	m s	m s
0	+ 3 01.2	+ 2 54.3	+ 2 46.9
6	+ 2 59.5	+ 2 52.5	+ 2 45.0
12	+ 2 57.8	+ 2 50.6	+ 2 43.1
18	+ 2 56.0	+ 2 48.8	+ 2 41.1
24	+ 2 54.3	+ 2 46.9	+ 2 39.1

Lat.	Sunrise	Twlt. begins	Moonrise 27	28	29	30
N °	h m	h m	h m	h m	h m	h m
72	□	□	▬	▬	2 07	1 26
70	□	□	▬	1 51	1 15	0 59
68	□	□	0 53	0 47	0 43	0 38
66	1 29	////	24 12	0 12	0 19	0 22
64	2 08	////	23 46	24 00	0 00	0 09
62	2 35	////	23 26	23 45	23 58	24 07
60	2 55	////	23 10	23 32	23 48	24 01
58	3 12	////	22 56	23 20	23 39	23 55
56	3 27	////	22 44	23 11	23 32	23 50
54	3 39	////	22 33	23 02	23 25	23 45
52	3 49	////	22 24	22 54	23 19	23 41
50	3 59	0 39	22 16	22 47	23 14	23 37
45	4 19	2 00	21 58	22 32	23 02	23 29
40	4 35	2 39	21 43	22 20	22 52	23 22
35	4 49	3 06	21 31	22 09	22 44	23 16
30	5 00	3 27	21 20	22 00	22 36	23 10
20	5 20	3 59	21 02	21 44	22 24	23 01
10	5 38	4 22	20 45	21 30	22 12	22 53
0	5 54	4 39	20 30	21 17	22 02	22 45
10	6 09	4 55	20 15	21 04	21 51	22 38
20	6 26	5 08	19 59	20 50	21 40	22 29
30	6 46	5 21	19 40	20 33	21 27	22 20
35	6 57	5 27	19 29	20 24	21 19	22 14
40	7 09	5 33	19 17	20 13	21 11	22 08
45	7 25	5 40	19 02	20 00	21 01	22 01
50	7 43	5 46	18 44	19 45	20 48	21 52
52	7 52	5 48	18 35	19 38	20 43	21 48
54	8 01	5 51	18 26	19 30	20 36	21 44
56	8 13	5 54	18 15	19 21	20 29	21 39
58	8 25	5 56	18 02	19 10	20 21	21 34
60	8 40	6 00	17 48	18 58	20 12	21 27

Lat.	Sunset	Twlt. ends	Moonset 27	28	29	30
N °	h m	h m	h m	h m	h m	h m
72	□	□	▬	▬	5 02	7 16
70	□	□	▬	3 41	5 53	7 42
68	□	□	3 00	4 45	6 25	8 01
66	22 29	////	3 56	5 20	6 48	8 16
64	21 49	////	4 29	5 45	7 06	8 28
62	21 21	////	4 53	6 04	7 21	8 39
60	21 00	////	5 12	6 20	7 33	8 48
58	20 43	////	5 28	6 34	7 44	8 56
56	20 29	////	5 42	6 46	7 53	9 03
54	20 16	////	5 53	6 56	8 01	9 09
52	20 06	////	6 04	7 05	8 08	9 14
50	19 56	23 23	6 13	7 13	8 15	9 19
45	19 36	21 57	6 32	7 30	8 29	9 30
40	19 20	21 17	6 48	7 44	8 41	9 38
35	19 06	20 49	7 01	7 55	8 51	9 46
30	18 54	20 28	7 13	8 06	8 59	9 52
20	18 34	19 56	7 32	8 23	9 14	10 04
10	18 17	19 33	7 50	8 39	9 27	10 14
0	18 01	19 15	8 06	8 53	9 39	10 23
10	17 45	18 59	8 21	9 07	9 51	10 32
20	17 28	18 46	8 38	9 22	10 03	10 42
30	17 09	18 33	8 58	9 40	10 18	10 53
35	16 58	18 27	9 09	9 50	10 26	10 59
40	16 45	18 21	9 22	10 01	10 35	11 06
45	16 30	18 15	9 37	10 14	10 46	11 15
50	16 11	18 08	9 56	10 31	11 00	11 25
52	16 03	18 06	10 05	10 38	11 06	11 29
54	15 53	18 02	10 15	10 47	11 13	11 34
56	15 42	17 59	10 26	10 56	11 20	11 40
58	15 29	17 56	10 39	11 07	11 29	11 46
60	15 14	17 52	10 53	11 19	11 38	11 53

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
27	1 54	14 18	5 37	17 25	23 27
28	2 42	14 15	5 36	17 22	23 23
29	3 28	14 11	5 34	17 18	23 19
30	4 12	14 08	5 32	17 15	23 14

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.1	0.4	0.2
30	0.1	0.3	0.1
45	0.1	0.2	0.1
60	0.1	0.2	0.1
75	0.1	0.1	0.0
90			

Moon's Lower Limb **Add**

Alt.	27	28	29
°	′	′	′
0	12.0	11.9	11.9
4	12.0	11.9	11.9
8	12.0	11.9	11.9
12	12.1	11.9	11.9
16	12.1	12.0	12.0
20	12.2	12.1	12.1
24	12.3	12.2	12.2
28	12.4	12.2	12.2
32	12.5	12.4	12.4
36	12.6	12.5	12.5
40	12.7	12.6	12.6
44	12.8	12.7	12.7
48	13.0	12.9	12.9
52	13.1	13.1	13.1
56	13.3	13.2	13.2
60	13.5	13.4	13.4
64	13.6	13.6	13.6
68	13.8	13.8	13.8
72	14.0	14.0	14.0
76	14.2	14.2	14.2
80	14.4	14.4	14.4
84	14.6	14.6	14.6
88	14.7	14.7	14.7
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	27	28	29
°	′	′	′
0	17.6	17.7	17.7
4	17.6	17.6	17.6
8	17.5	17.6	17.6
12	17.5	17.6	17.6
16	17.5	17.5	17.5
20	17.4	17.5	17.5
24	17.3	17.4	17.4
28	17.2	17.3	17.3
32	17.1	17.2	17.2
36	17.0	17.0	17.0
40	16.9	16.9	16.9
44	16.7	16.8	16.8
48	16.6	16.6	16.6
52	16.4	16.5	16.5
56	16.3	16.3	16.3
60	16.1	16.1	16.1
64	15.9	15.9	15.9
68	15.7	15.8	15.8
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.2
84	15.0	15.0	15.0
88	14.8	14.8	14.8
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −4.1 GHA	Dec.	MARS −0.3 GHA	Dec.	JUPITER −1.5 GHA	Dec.	SATURN 0.3 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
30 0	247 28.8	147 32.2	+25 43.2	276 48.8	−14 44.5	100 43.4	+14 28.1	10 22.3	−17 43.9	298 47.5	144	−13 59.9	+ 88
1	262 31.3	162 34.5	42.9	291 49.8	44.1	115 45.6	28.0	25 25.0	43.9	313 20.9	143	13 51.1	+ 88
2	277 33.7	177 36.8	42.5	306 50.9	43.7	130 47.8	27.9	40 27.6	43.8	327 54.2	144	13 42.3	+ 89
3	292 36.2	192 39.1	42.2	321 51.9	43.3	145 50.0	27.8	55 30.3	43.8	342 27.6	144	−13 33.4	+ 89
4	307 38.6	207 41.4	41.8	336 53.0	42.9	160 52.1	27.7	70 32.9	43.8	357 01.0	144	13 24.5	+ 90
5	322 41.1	222 43.7	41.5	351 54.0	42.5	175 54.3	27.6	85 35.6	43.7	11 34.4	145	13 15.5	+ 90
6	337 43.6	237 46.1	+25 41.2	6 55.1	−14 42.1	190 56.5	+14 27.5	100 38.2	−17 43.7	26 07.9	145	−13 06.5	+ 91
7	352 46.0	252 48.4	40.8	21 56.1	41.7	205 58.7	27.4	115 40.9	43.6	40 41.4	146	12 57.4	+ 92
8	7 48.5	267 50.7	40.5	36 57.2	41.3	221 00.9	27.3	130 43.5	43.6	55 15.0	145	12 48.2	+ 92
9	22 51.0	282 53.1	40.1	51 58.2	40.9	236 03.1	27.2	145 46.2	43.6	69 48.5	146	−12 39.0	+ 93
10	37 53.4	297 55.4	39.8	66 59.3	40.5	251 05.2	27.1	160 48.8	43.5	84 22.1	146	12 29.7	+ 93
11	52 55.9	312 57.8	39.4	82 00.3	40.1	266 07.4	27.0	175 51.5	43.5	98 55.7	147	12 20.4	+ 94
12	67 58.4	328 00.1	+25 39.1	97 01.4	−14 39.7	281 09.6	+14 26.9	190 54.1	−17 43.5	113 29.4	146	−12 11.0	+ 94
13	83 00.8	343 02.5	38.7	112 02.4	39.3	296 11.8	26.8	205 56.8	43.4	128 03.0	147	12 01.6	+ 95
14	98 03.3	358 04.9	38.4	127 03.5	38.9	311 14.0	26.7	220 59.4	43.4	142 36.7	147	11 52.1	+ 95
15	113 05.8	13 07.2	38.0	142 04.5	38.5	326 16.1	26.6	236 02.1	43.4	157 10.4	148	−11 42.6	+ 96
16	128 08.2	28 09.6	37.7	157 05.6	38.1	341 18.3	26.5	251 04.7	43.3	171 44.2	147	11 33.0	+ 96
17	143 10.7	43 12.0	37.3	172 06.7	37.7	356 20.5	26.4	266 07.4	43.3	186 17.9	148	11 23.4	+ 97
18	158 13.1	58 14.3	+25 37.0	187 07.7	−14 37.3	11 22.7	+14 26.3	281 10.0	−17 43.3	200 51.7	148	−11 13.7	+ 97
19	173 15.6	73 16.7	36.6	202 08.8	36.8	26 24.9	26.2	296 12.7	43.2	215 25.5	148	11 04.0	+ 98
20	188 18.1	88 19.1	36.3	217 09.8	36.4	41 27.0	26.1	311 15.3	43.2	229 59.3	149	10 54.2	+ 98
21	203 20.5	103 21.5	35.9	232 10.9	36.0	56 29.2	26.0	326 18.0	43.1	244 33.2	148	−10 44.4	+ 99
22	218 23.0	118 23.9	35.5	247 11.9	35.6	71 31.4	25.9	341 20.6	43.1	259 07.0	149	10 34.5	+ 99
23	233 25.5	133 26.3	35.2	262 13.0	35.2	86 33.6	25.8	356 23.3	43.1	273 40.9	149	10 24.6	+100
31 0	248 27.9	148 28.7	+25 34.8	277 14.0	−14 34.8	101 35.7	+14 25.7	11 25.9	−17 43.0	288 14.8	149	−10 14.6	+100
1	263 30.4	163 31.1	34.5	292 15.1	34.4	116 37.9	25.6	26 28.6	43.0	302 48.7	150	10 04.6	+101
2	278 32.9	178 33.6	34.1	307 16.1	34.0	131 40.1	25.5	41 31.2	43.0	317 22.7	149	9 54.5	+101
3	293 35.3	193 36.0	33.8	322 17.2	33.6	146 42.3	25.4	56 33.9	42.9	331 56.6	150	− 9 44.4	+101
4	308 37.8	208 38.4	33.4	337 18.3	33.2	161 44.5	25.2	71 36.5	42.9	346 30.6	150	9 34.3	+102
5	323 40.3	223 40.8	33.1	352 19.3	32.8	176 46.6	25.1	86 39.2	42.9	1 04.6	150	9 24.1	+102
6	338 42.7	238 43.3	+25 32.7	7 20.4	−14 32.4	191 48.8	+14 25.0	101 41.8	−17 42.8	15 38.6	150	− 9 13.9	+103
7	353 45.2	253 45.7	32.3	22 21.4	32.0	206 51.0	24.9	116 44.5	42.8	30 12.6	150	9 03.6	+103
8	8 47.6	268 48.2	32.0	37 22.5	31.6	221 53.2	24.8	131 47.1	42.8	44 46.6	150	8 53.3	+104
9	23 50.1	283 50.6	31.6	52 23.6	31.2	236 55.3	24.7	146 49.8	42.7	59 20.6	151	− 8 42.9	+104
10	38 52.6	298 53.1	31.3	67 24.6	30.8	251 57.5	24.6	161 52.4	42.7	73 54.7	151	8 32.5	+104
11	53 55.0	313 55.5	30.9	82 25.7	30.4	266 59.7	24.5	176 55.1	42.7	88 28.8	150	8 22.1	+105
12	68 57.5	328 58.0	+25 30.5	97 26.7	−14 30.0	282 01.9	+14 24.4	191 57.8	−17 42.6	103 02.8	151	− 8 11.6	+105
13	84 00.0	344 00.5	30.2	112 27.8	29.6	297 04.0	24.3	207 00.4	42.6	117 36.9	151	8 01.1	+106
14	99 02.4	359 02.9	29.8	127 28.8	29.2	312 06.2	24.2	222 03.1	42.5	132 11.0	151	7 50.5	+106
15	114 04.9	14 05.4	29.5	142 29.9	28.8	327 08.4	24.1	237 05.7	42.5	146 45.1	151	− 7 39.9	+106
16	129 07.4	29 07.9	29.1	157 31.0	28.4	342 10.6	24.0	252 08.4	42.5	161 19.2	151	7 29.3	+107
17	144 09.8	44 10.4	28.7	172 32.0	28.0	357 12.7	23.9	267 11.0	42.4	175 53.3	151	7 18.6	+107
18	159 12.3	59 12.9	+25 28.4	187 33.1	−14 27.6	12 14.9	+14 23.8	282 13.7	−17 42.4	190 27.4	151	− 7 07.9	+107
19	174 14.8	74 15.3	28.0	202 34.2	27.2	27 17.1	23.7	297 16.3	42.4	205 01.5	151	6 57.2	+108
20	189 17.2	89 17.8	27.6	217 35.2	26.8	42 19.3	23.6	312 19.0	42.3	219 35.6	151	6 46.4	+108
21	204 19.7	104 20.4	27.3	232 36.3	26.4	57 21.4	23.5	327 21.6	42.3	234 09.7	151	− 6 35.6	+108
22	219 22.1	119 22.9	26.9	247 37.3	26.0	72 23.6	23.4	342 24.3	42.3	248 43.8	152	6 24.8	+109
23	234 24.6	134 25.4	26.5	262 38.4	25.6	87 25.8	23.3	357 26.9	42.2	263 18.0	151	6 13.9	+109
1 0	249 27.1	149 27.9	+25 26.2	277 39.5	−14 25.2	102 28.0	+14 23.2	12 29.6	−17 42.2	277 52.1	151	− 6 03.0	+110
1	264 29.5	164 30.4	25.8	292 40.5	24.8	117 30.1	23.1	27 32.2	42.2	292 26.2	151	5 52.0	+109
2	279 32.0	179 32.9	25.4	307 41.6	24.4	132 32.3	23.0	42 34.9	42.1	307 00.3	151	5 41.1	+110
3	294 34.5	194 35.5	25.1	322 42.7	24.0	147 34.5	22.9	57 37.5	42.1	321 34.4	151	− 5 30.1	+111
4	309 36.9	209 38.0	24.7	337 43.7	23.6	162 36.6	22.8	72 40.1	42.1	336 08.5	151	5 19.0	+110
5	324 39.4	224 40.5	24.3	352 44.8	23.2	177 38.8	22.6	87 42.8	42.0	350 42.6	151	5 08.0	+111
6	339 41.9	239 43.1	+25 24.0	7 45.9	−14 22.8	192 41.0	+14 22.5	102 45.4	−17 42.0	5 16.7	151	− 4 56.9	+112
7	354 44.3	254 45.6	23.6	22 46.9	22.4	207 43.2	22.4	117 48.1	42.0	19 50.8	151	4 45.7	+111
8	9 46.8	269 48.2	23.2	37 48.0	22.0	222 45.3	22.3	132 50.7	41.9	34 24.9	151	4 34.6	+112
9	24 49.2	284 50.7	22.9	52 49.1	21.6	237 47.5	22.2	147 53.4	41.9	48 59.0	151	− 4 23.4	+112
10	39 51.7	299 53.3	22.5	67 50.1	21.2	252 49.7	22.1	162 56.0	41.8	63 33.1	151	4 12.2	+112
11	54 54.2	314 55.9	22.1	82 51.2	20.8	267 51.8	22.0	177 58.7	41.8	78 07.2	150	4 01.0	+113
12	69 56.6	329 58.4	+25 21.7	97 52.3	−14 20.4	282 54.0	+14 21.9	193 01.3	−17 41.8	92 41.2	150	− 3 49.7	+113
13	84 59.1	345 01.0	21.4	112 53.3	20.0	297 56.2	21.8	208 04.0	41.7	107 15.2	151	3 38.4	+113
14	100 01.6	0 03.6	21.0	127 54.4	19.6	312 58.3	21.7	223 06.6	41.7	121 49.3	150	3 27.1	+113
15	115 04.0	15 06.2	20.6	142 55.5	19.2	328 00.5	21.6	238 09.3	41.7	136 23.3	150	− 3 15.8	+114
16	130 06.5	30 08.8	20.2	157 56.6	18.8	343 02.7	21.5	253 11.9	41.6	150 57.3	150	3 04.4	+113
17	145 09.0	45 11.4	19.9	172 57.6	18.4	358 04.9	21.4	268 14.6	41.6	165 31.3	150	2 53.1	+114
18	160 11.4	60 14.0	+25 19.5	187 58.7	−14 18.0	13 07.0	+14 21.3	283 17.2	−17 41.6	180 05.3	149	− 2 41.7	+115
19	175 13.9	75 16.6	19.1	202 59.8	17.6	28 09.2	21.2	298 19.9	41.5	194 39.2	149	2 30.2	+114
20	190 16.4	90 19.2	18.7	218 00.8	17.2	43 11.4	21.1	313 22.5	41.5	209 13.1	150	2 18.5	+115
21	205 18.8	105 21.8	18.4	233 01.9	16.8	58 13.5	21.0	328 25.2	41.5	223 47.1	149	− 2 07.3	+114
22	220 21.3	120 24.4	18.0	248 03.0	16.4	73 15.7	20.8	343 27.8	41.4	238 21.0	148	1 55.9	+115
23	235 23.7	135 27.0	17.6	263 04.0	16.0	88 17.9	20.7	358 30.5	41.4	252 54.8	149	1 44.4	+116
24	250 26.2	150 29.7	+25 17.2	278 05.1	−14 15.6	103 20.0	+14 20.6	13 33.1	−17 41.4	267 28.7	148	− 1 32.8	+115
code	—	+ 25	− 3	+ 11	+ 4	+ 21	− 1	+ 26	0				

G M T	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
30 0	180 39.7	+21 44.0	7	Acamar	315 51.1	−40 28.6
1	195 39.6	44.4	5	Achernar	335 58.9	−57 27.2
2	210 39.6	44.8	30	Acrux	173 56.9	−62 51.9
3	225 39.5	·· 45.2	19	Adhara	255 46.5	−28 54.9
4	240 39.4	45.5	10	Aldebaran	291 38.8	+16 25.3
5	255 39.3	45.9				
6	270 39.2	+21 46.3	32	Alioth	166 57.8	+56 11.9
7	285 39.1	46.7	34	Alkaid	153 32.2	+49 31.9
8	300 39.1	47.0	55	Al Na'ir	28 37.2	−47 10.0
9	315 39.0	·· 47.4	15	Alnilam	276 30.1	− 1 13.8
10	330 38.9	47.8	25	Alphard	218 38.2	− 8 28.3
11	345 38.8	48.1				
12	0 38.7	+21 48.5	41	Alphecca	126 46.9	+26 51.6
13	15 38.6	48.9	1	Alpheratz	358 27.9	+28 50.9
14	30 38.5	49.2	51	Altair	62 49.7	+ 8 45.1
15	45 38.4	·· 49.6	2	Ankaa	353 58.0	−42 32.3
16	60 38.4	50.0	42	Antares	113 18.4	−26 20.3
17	75 38.3	50.3				
18	90 38.2	+21 50.7	37	Arcturus	146 34.4	+19 24.5
19	105 38.1	51.1	43	Atria	108 58.1	−68 57.0
20	120 38.0	51.4	22	Avior	234 35.9	−59 22.5
21	135 37.9	·· 51.8	13	Bellatrix	279 18.2	+ 6 18.6
22	150 37.8	52.1	16	Betelg'se	271 47.9	+ 7 23.9
23	165 37.7	52.5				
			17	Canopus	264 15.6	−52 40.5
31 0	180 37.7	+21 52.9	12	Capella	281 38.2	+45 57.3
1	195 37.6	53.2	53	Deneb	50 00.4	+45 07.3
2	210 37.5	53.6	28	Denebola	183 17.1	+14 48.9
3	225 37.4	·· 53.9	4	Diphda	349 38.9	−18 13.4
4	240 37.3	54.3				
5	255 37.2	54.7	27	Dubhe	194 44.0	+61 59.4
6	270 37.1	+21 55.0	14	Elnath	279 07.1	+28 34.3
7	285 37.0	55.4	47	Eltanin	91 05.5	+51 29.6
8	300 36.9	55.7	54	Enif	34 29.0	+ 9 40.5
9	315 36.9	·· 56.1	56	Fomalhaut	16 11.1	−29 51.0
10	330 36.8	56.4				
11	345 36.7	56.8	31	Gacrux	172 48.4	−56 52.5
12	0 36.6	+21 57.1	29	Gienah	176 36.2	−17 18.2
13	15 36.5	57.5	35	Hadar	149 48.2	−60 10.1
14	30 36.4	57.8	6	Hamal	328 49.3	+23 15.4
15	45 36.3	·· 58.2	48	Kaus Aust.	84 40.1	−34 24.3
16	60 36.2	58.5				
17	75 36.1	58.9	40	Kochab	137 17.0	+74 20.1
18	90 36.0	+21 59.2	57	Markab	14 21.0	+14 58.2
19	105 35.9	59.6	8	Menkar	315 00.1	+ 3 55.2
20	120 35.9	21 59.9	36	Menkent	148 57.7	−36 09.6
21	135 35.8	·22 00.3	24	Miapl'dus	221 49.2	−69 32.7
22	150 35.7	00.6				
23	165 35.6	01.0	9	Mirfak	309 42.1	+49 42.4
			50	Nunki	76 51.0	−26 21.0
1 0	180 35.5	+22 01.3	52	Peacock	54 26.1	−56 52.3
1	195 35.4	01.6	21	Pollux	244 20.2	+28 08.0
2	210 35.3	02.0	20	Procyon	245 44.7	+ 5 20.2
3	225 35.2	·· 02.3				
4	240 35.1	02.7	46	R'alhague	96 45.8	+12 35.4
5	255 35.0	03.0	26	Regulus	208 29.0	+12 10.8
6	270 34.9	+22 03.4	11	Rigel	281 53.5	− 8 15.1
7	285 34.8	03.7	38	Rigil Kent.	140 49.7	−60 39.7
8	300 34.7	04.0	44	Sabik	103 01.3	−15 40.4
9	315 34.6	·· 04.4				
10	330 34.5	04.7	3	Schedar	350 29.6	+56 17.7
11	345 34.4	05.0	45	Shaula	97 19.6	−37 04.4
12	0 34.4	+22 05.4	18	Sirius	259 11.7	−16 39.5
13	15 34.3	05.7	33	Spica	159 16.1	−10 56.2
14	30 34.2	06.1	23	Suhail	223 24.1	−43 15.7
15	45 34.1	·· 06.4				
16	60 34.0	06.7	49	Vega	81 07.5	+38 44.5
17	75 33.9	07.1	39	Zub'g'bi	137 52.5	−15 51.8
18	90 33.8	+22 07.4				
19	105 33.7	07.7				
20	120 33.6	08.0				
21	135 33.5	·· 08.4				
22	150 33.4	08.7				
23	165 33.3	09.0				
24	180 33.2	+22 09.4				
code	—	+ 4				

Lat.	Sunrise	Twlt. begins	Moonrise 30	31	1	2
N °	h m	h m	h m	h m	h m	h m
72	□	□	1 26	1 03	0 46	0 30
70	□	□	0 59	0 47	0 37	0 28
68	□	□	0 38	0 34	0 30	0 27
66	1 16	////	0 22	0 24	0 25	0 25
64	2 00	////	0 09	0 15	0 20	0 24
62	2 29	////	24 07	0 07	0 15	0 23
60	2 51	////	24 01	0 01	0 12	0 22
58	3 08	////	23 55	24 08	0 08	0 21
56	3 23	////	23 50	24 05	0 05	0 20
54	3 36	////	23 45	24 03	0 03	0 20
52	3 47	////	23 41	24 00	0 00	0 19
50	3 57	0 16	23 37	23 58	24 18	0 18
45	4 17	1 55	23 29	23 53	24 17	0 17
40	4 34	2 36	23 22	23 49	24 16	0 16
35	4 47	3 04	23 16	23 46	24 15	0 15
30	5 00	3 26	23 10	23 43	24 15	0 15
20	5 20	3 57	23 01	23 37	24 13	0 13
10	5 38	4 21	22 53	23 32	24 12	0 12
0	5 54	4 40	22 45	23 28	24 11	0 11
10	6 10	4 55	22 38	23 24	24 10	0 10
20	6 27	5 09	22 29	23 19	24 09	0 09
30	6 47	5 22	22 20	23 13	24 07	0 07
35	6 59	5 28	22 14	23 10	24 07	0 07
40	7 12	5 35	22 08	23 07	24 06	0 06
45	7 27	5 41	22 01	23 02	24 05	0 05
50	7 46	5 48	21 52	22 57	24 04	0 04
52	7 55	5 51	21 48	22 55	24 03	0 03
54	8 05	5 54	21 44	22 53	24 03	0 03
56	8 16	5 57	21 39	22 50	24 02	0 02
58	8 30	6 00	21 34	22 47	24 01	0 01
60	8 45	6 03	21 27	22 43	24 00	0 00
S						

Lat.	Sunset	Twlt. ends	Moonset 30	31	1	2
N °	h m	h m	h m	h m	h m	h m
72	□	□	7 16	9 09	10 56	12 42
70	□	□	7 42	9 23	11 02	12 41
68	□	□	8 01	9 35	11 07	12 40
66	22 43	////	8 16	9 44	11 11	12 39
64	21 57	////	8 28	9 51	11 14	12 39
62	21 28	////	8 39	9 58	11 17	12 38
60	21 06	////	8 48	10 03	11 20	12 38
58	20 48	////	8 56	10 08	11 22	12 37
56	20 33	////	9 03	10 13	11 24	12 37
54	20 20	////	9 09	10 17	11 26	12 36
52	20 09	////	9 14	10 20	11 27	12 36
50	19 59	////	9 19	10 24	11 29	12 36
45	19 39	22 03	9 30	10 31	11 32	12 35
40	19 22	21 21	9 38	10 36	11 35	12 35
35	19 08	20 52	9 46	10 41	11 37	12 34
30	18 56	20 30	9 52	10 46	11 39	12 34
20	18 35	19 58	10 04	10 53	11 43	12 33
10	18 18	19 35	10 14	11 00	11 46	12 32
0	18 01	19 15	10 23	11 06	11 48	12 32
10	17 45	19 00	10 32	11 12	11 51	12 31
20	17 28	18 46	10 42	11 18	11 54	12 30
30	17 08	18 33	10 53	11 26	11 58	12 29
35	16 57	18 27	10 59	11 30	11 59	12 29
40	16 44	18 20	11 06	11 35	12 02	12 29
45	16 28	18 13	11 15	11 40	12 04	12 28
50	16 09	18 06	11 25	11 47	12 07	12 27
52	16 00	18 03	11 29	11 50	12 08	12 27
54	15 50	18 00	11 34	11 53	12 10	12 26
56	15 39	17 57	11 40	11 56	12 11	12 26
58	15 26	17 54	11 46	12 00	12 13	12 26
60	15 10	17 50	11 53	12 05	12 15	12 25
S						

G M T	Equation of Time (App.—Mean) 30	31	1
h	m s	m s	m s
0	+ 2 39.1	+ 2 30.8	+ 2 22.1
6	+ 2 37.1	+ 2 28.7	+ 2 19.9
12	+ 2 35.0	+ 2 26.5	+ 2 17.6
18	+ 2 32.9	+ 2 24.3	+ 2 15.3
24	+ 2 30.8	+ 2 22.1	+ 2 13.0

GMT of Transit Meridian of Greenwich DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
30	4 12	14 08	5 32	17 15	23 14
31	4 56	14 04	5 31	17 11	23 10
1	5 38	14 00	5 29	17 08	23 06
2	6 21	13 56	5 27	17 04	23 02

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.1	0.4	0.2
30	0.1	0.3	0.1
45	0.1	0.2	0.1
60	0.1	0.2	0.1
75	0.1	0.1	0.0
90			

Moon's Lower Limb Add

Alt.	30	31	1
°	′	′	′
0	12.1	12.5	13.1
4	12.1	12.5	13.1
8	12.2	12.5	13.2
12	12.2	12.6	13.2
16	12.2	12.6	13.2
20	12.3	12.7	13.3
24	12.4	12.7	13.3
28	12.5	12.8	13.4
32	12.6	12.9	13.5
36	12.7	13.0	13.5
40	12.8	13.1	13.6
44	12.9	13.2	13.7
48	13.1	13.4	13.8
52	13.2	13.5	13.9
56	13.4	13.6	14.0
60	13.5	13.8	14.1
64	13.7	13.9	14.3
68	13.9	14.1	14.4
72	14.1	14.2	14.5
76	14.3	14.4	14.6
80	14.4	14.6	14.8
84	14.6	14.7	14.9
88	14.8	14.9	15.0
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	30	31	1
°	′	′	′
0	17.5	17.3	16.9
4	17.5	17.3	16.9
8	17.5	17.3	16.9
12	17.4	17.2	16.9
16	17.4	17.2	16.8
20	17.3	17.1	16.8
24	17.2	17.1	16.7
28	17.2	17.0	16.7
32	17.1	16.9	16.6
36	16.9	16.8	16.5
40	16.8	16.7	16.4
44	16.7	16.6	16.4
48	16.6	16.4	16.3
52	16.4	16.3	16.2
56	16.2	16.2	16.0
60	16.1	16.0	15.9
64	15.9	15.9	15.8
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.3
84	15.0	15.1	15.2
88	14.9	14.9	15.1
90			

Subtract from table, back cover

Memorial Day	30
Corpus Christi	31
Last Quarter	1

GMT	♈ GHA	VENUS −4.0 GHA	Dec	MARS −0.4 GHA	Dec	JUPITER −1.5 GHA	Dec	SATURN 0.3 GHA	Dec	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
2 00	250 26.2	150 29.7	+25 17.2	278 05.1	−14 15.6	103 20.0	+14 20.6	13 33.1	−17 41.4	267 28.7	148	− 1 32.8	+115
01	265 28.7	165 32.3	16.8	293 06.2	15.2	118 22.2	20.5	28 35.8	41.3	282 02.5	148	1 21.3	+116
02	280 31.1	180 34.9	16.5	308 07.3	14.8	133 24.4	20.4	43 38.4	41.3	296 36.3	148	1 09.7	+115
03	295 33.6	195 37.6	·· 16.1	323 08.3	·· 14.4	148 26.5	·· 20.3	58 41.1	·· 41.3	311 10.1	148	· 0 58.2	+116
04	310 36.1	210 40.2	15.7	338 09.4	14.0	163 28.7	20.2	73 43.7	41.2	325 43.9	147	0 46.6	+116
05	325 38.5	225 42.9	15.3	353 10.5	13.6	178 30.9	20.1	88 46.4	41.2	340 17.6	147	0 35.0	+116
06	340 41.0	240 45.5	+25 14.9	8 11.6	−14 13.2	193 33.0	+14 20.0	103 49.0	−17 41.2	354 51.3	147	− 0 23.4	+116
07	355 43.5	255 48.2	14.6	23 12.6	12.8	208 35.2	19.9	118 51.7	41.1	9 25.0	147	0 11.8	+117
08	10 45.9	270 50.8	14.2	38 13.7	12.4	223 37.4	19.8	133 54.3	41.1	23 58.7	146	− 0 00.1	+116
09	25 48.4	285 53.5	·· 13.8	53 14.8	·· 12.0	238 39.5	·· 19.7	148 57.0	·· 41.0	38 32.3	146	+ 0 11.5	+117
10	40 50.9	300 56.2	13.4	68 15.9	11.6	253 41.7	19.6	163 59.6	41.0	53 05.9	145	0 23.2	+117
11	55 53.3	315 58.8	13.0	83 16.9	11.2	268 43.9	19.5	179 02.3	41.0	67 39.4	145	0 34.9	+117
12	70 55.8	331 01.5	+25 12.6	98 18.0	−14 10.8	283 46.0	+14 19.4	194 04.9	−17 40.9	82 12.9	145	+ 0 46.6	+117
13	85 58.2	346 04.2	12.3	113 19.1	10.4	298 48.2	19.2	209 07.6	40.9	96 46.4	145	0 58.3	+117
14	101 00.7	1 06.9	11.9	128 20.2	10.0	313 50.4	19.1	224 10.2	40.9	111 19.9	144	1 10.0	+117
15	116 03.2	16 09.6	·· 11.5	143 21.3	·· 09.6	328 52.5	·· 19.0	239 12.9	·· 40.8	125 53.3	144	· 1 21.7	+117
16	131 05.6	31 12.3	11.1	158 22.3	09.2	343 54.7	18.9	254 15.5	40.8	140 26.7	143	1 33.4	+117
17	146 08.1	46 15.0	10.7	173 23.4	08.8	358 56.8	18.8	269 18.2	40.8	155 00.0	143	1 45.1	+117
18	161 10.6	61 17.7	+25 10.3	188 24.5	−14 08.4	13 59.0	+14 18.7	284 20.8	−17 40.7	169 33.3	143	+ 1 56.8	+118
19	176 13.0	76 20.4	09.9	203 25.6	08.0	29 01.2	18.6	299 23.5	40.7	184 06.6	142	2 08.6	+117
20	191 15.5	91 23.1	09.6	218 26.7	07.6	44 03.3	18.5	314 26.1	40.7	198 39.8	142	2 20.3	+118
21	206 18.0	106 25.9	·· 09.2	233 27.7	·· 07.2	59 05.5	·· 18.4	329 28.7	·· 40.6	213 13.0	141	· 2 32.1	+117
22	221 20.4	121 28.6	08.8	248 28.8	06.8	74 07.7	18.3	344 31.4	40.6	227 46.1	141	2 43.8	+117
23	236 22.9	136 31.3	08.4	263 29.9	06.4	89 09.8	18.2	359 34.0	40.6	242 19.2	141	2 55.5	+118
3 00	251 25.4	151 34.0	+25 08.0	278 31.0	−14 06.0	104 12.0	+14 18.1	14 36.7	−17 40.5	256 52.3	140	+ 3 07.3	+117
01	266 27.8	166 36.8	07.6	293 32.1	05.6	119 14.2	17.9	29 39.3	40.5	271 25.3	139	3 19.0	+118
02	281 30.3	181 39.5	07.2	308 33.1	05.2	134 16.3	17.8	44 42.0	40.5	285 58.2	139	3 30.8	+117
03	296 32.7	196 42.3	·· 06.8	323 34.2	·· 04.8	149 18.5	·· 17.7	59 44.6	·· 40.4	300 31.1	139	· 3 42.5	+118
04	311 35.2	211 45.0	06.4	338 35.3	04.4	164 20.6	17.6	74 47.3	40.4	315 04.0	138	3 54.3	+117
05	326 37.7	226 47.8	06.0	353 36.4	04.0	179 22.8	17.5	89 49.9	40.4	329 36.8	138	4 06.0	+118
06	341 40.1	241 50.6	+25 05.6	8 37.5	−14 03.6	194 25.0	+14 17.4	104 52.6	−17 40.3	344 09.6	137	+ 4 17.8	+117
07	356 42.6	256 53.3	05.2	23 38.6	03.2	209 27.1	17.3	119 55.2	40.3	358 42.3	136	4 29.5	+117
08	11 45.1	271 56.1	04.9	38 39.6	02.8	224 29.3	17.2	134 57.9	40.3	13 14.9	136	4 41.2	+117
09	26 47.5	286 58.9	·· 04.5	53 40.7	·· 02.4	239 31.4	·· 17.1	150 00.5	·· 40.2	27 47.5	136	· 4 52.9	+117
10	41 50.0	302 01.7	04.1	68 41.8	02.0	254 33.6	17.0	165 03.2	40.2	42 20.1	135	5 04.6	+118
11	56 52.5	317 04.5	03.7	83 42.9	01.6	269 35.8	16.9	180 05.8	40.2	56 52.6	134	5 16.4	+116
12	71 54.9	332 07.2	+25 03.3	98 44.0	−14 01.2	284 37.9	+14 16.7	195 08.5	−17 40.1	71 25.0	134	+ 5 28.0	+117
13	86 57.4	347 10.0	02.9	113 45.1	00.8	299 40.1	16.6	210 11.1	40.1	85 57.4	133	5 39.7	+117
14	101 59.8	2 12.8	02.5	128 46.2	00.4	314 42.2	16.5	225 13.7	40.1	100 29.7	132	5 51.4	+117
15	117 02.3	17 15.6	·· 02.1	143 47.3	·14 00.0	329 44.4	·· 16.4	240 16.4	·· 40.0	115 01.9	132	· 6 03.1	+116
16	132 04.8	32 18.5	01.7	158 48.3	13 59.6	344 46.6	16.3	255 19.0	40.0	129 34.1	132	6 14.7	+117
17	147 07.2	47 21.3	01.3	173 49.4	59.2	359 48.7	16.2	270 21.7	39.9	144 06.3	130	6 26.4	+116
18	162 09.7	62 24.1	+25 00.9	188 50.5	−13 58.8	14 50.9	+14 16.1	285 24.3	−17 39.9	158 38.3	130	+ 6 38.0	+116
19	177 12.2	77 26.9	00.5	203 51.6	58.4	29 53.0	16.0	300 27.0	39.9	173 10.3	130	6 49.6	+116
20	192 14.6	92 29.7	25 00.1	218 52.7	58.0	44 55.2	15.9	315 29.6	39.8	187 42.3	128	7 01.2	+116
21	207 17.1	107 32.6	·24 59.7	233 53.8	·· 57.6	59 57.4	·· 15.8	330 32.3	·· 39.8	202 14.1	128	· 7 12.8	+115
22	222 19.6	122 35.4	59.3	248 54.9	57.2	74 59.5	15.7	345 34.9	39.8	216 45.9	128	7 24.3	+115
23	237 22.0	137 38.3	58.9	263 56.0	56.8	90 01.7	15.5	0 37.6	39.7	231 17.7	127	7 35.8	+116
4 00	252 24.5	152 41.1	+24 58.5	278 57.1	−13 56.4	105 03.8	+14 15.4	15 40.2	−17 39.7	245 49.4	125	+ 7 47.4	+114
01	267 27.0	167 43.9	58.1	293 58.1	56.0	120 06.0	15.3	30 42.9	39.7	260 20.9	126	7 58.8	+115
02	282 29.4	182 46.8	57.7	308 59.2	55.6	135 08.1	15.2	45 45.5	39.6	274 52.5	124	8 10.3	+115
03	297 31.9	197 49.7	·· 57.3	324 00.3	·· 55.2	150 10.3	·· 15.1	60 48.2	·· 39.6	289 23.9	124	· 8 21.8	+114
04	312 34.3	212 52.5	56.9	339 01.4	54.8	165 12.5	15.0	75 50.8	39.6	303 55.3	123	8 33.2	+114
05	327 36.8	227 55.4	56.5	354 02.5	54.4	180 14.6	14.9	90 53.4	39.5	318 26.6	123	8 44.6	+113
06	342 39.3	242 58.3	+24 56.1	9 03.6	−13 54.0	195 16.8	+14 14.8	105 56.1	−17 39.5	332 57.9	121	+ 8 55.9	+114
07	357 41.7	258 01.2	55.6	24 04.7	53.6	210 18.9	14.7	120 58.7	39.5	347 29.0	121	9 07.3	+113
08	12 44.2	273 04.0	55.2	39 05.8	53.2	225 21.1	14.5	136 01.4	39.4	2 00.1	120	9 18.6	+113
09	27 46.7	288 06.9	·· 54.8	54 06.9	·· 52.8	240 23.2	·· 14.4	151 04.0	·· 39.4	16 31.1	120	· 9 29.9	+112
10	42 49.1	303 09.8	54.4	69 08.0	52.4	255 25.4	14.3	166 06.7	39.4	31 02.1	118	9 41.1	+112
11	57 51.6	318 12.7	54.0	84 09.1	52.0	270 27.5	14.2	181 09.3	39.3	45 32.9	118	9 52.3	+112
12	72 54.1	333 15.6	+24 53.6	99 10.2	−13 51.6	285 29.7	+14 14.1	196 12.0	−17 39.3	60 03.7	117	+10 03.5	+112
13	87 56.5	348 18.5	53.2	114 11.3	51.2	300 31.9	14.0	211 14.6	39.3	74 34.4	116	10 14.7	+111
14	102 59.0	3 21.4	52.8	129 12.4	50.8	315 34.0	13.9	226 17.3	39.2	89 05.0	115	10 25.8	+111
15	118 01.5	18 24.3	·· 52.4	144 13.5	·· 50.4	330 36.2	·· 13.8	241 19.9	·· 39.2	103 35.5	114	·10 36.9	+110
16	133 03.9	33 27.3	52.0	159 14.6	50.0	345 38.3	13.7	256 22.5	39.2	118 05.9	114	10 47.9	+110
17	148 06.4	48 30.2	51.6	174 15.7	49.6	0 40.5	13.5	271 25.2	39.1	132 36.3	113	10 58.9	+110
18	163 08.8	63 33.1	+24 51.1	189 16.8	−13 49.2	15 42.6	+14 13.4	286 27.8	−17 39.1	147 06.6	112	+11 09.9	+109
19	178 11.3	78 36.1	50.7	204 17.9	48.9	30 44.8	13.3	301 30.5	39.1	161 36.8	111	11 20.8	+108
20	193 13.8	93 39.0	50.3	219 19.0	48.5	45 46.9	13.2	316 33.1	39.0	176 06.9	110	11 31.6	+109
21	208 16.2	108 41.9	·· 49.9	234 20.1	·· 48.1	60 49.1	·· 13.1	331 35.8	·· 39.0	190 36.9	109	·11 42.5	+107
22	223 18.7	123 44.9	49.5	249 21.2	47.7	75 51.2	13.0	346 38.4	39.0	205 06.8	109	11 53.2	+108
23	238 21.2	138 47.8	49.1	264 22.3	47.3	90 53.4	12.9	1 41.1	38.9	219 36.7	107	12 04.0	+107
24	253 23.6	153 50.8	+24 48.7	279 23.4	−13 46.9	105 55.6	+14 12.8	16 43.7	−17 38.9	234 06.4	107	+12 14.7	+106
code	—	+ 28	− 4	+ 11	+ 4	+ 22	− 1	+ 26	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
2 0	180 33.2	+22 09.4
1	195 33.1	09.7
2	210 33.0	10.0
3	225 32.9	10.3
4	240 32.8	10.7
5	255 32.7	11.0
6	270 32.6	+22 11.3
7	285 32.5	11.6
8	300 32.4	12.0
9	315 32.3	12.3
10	330 32.2	12.6
11	345 32.1	12.9
12	0 32.0	+22 13.2
13	15 31.9	13.6
14	30 31.8	13.9
15	45 31.7	14.2
16	60 31.6	14.5
17	75 31.5	14.8
18	90 31.4	+22 15.1
19	105 31.3	15.5
20	120 31.2	15.8
21	135 31.1	16.1
22	150 31.0	16.4
23	165 30.9	16.7
3 0	180 30.8	+22 17.0
1	195 30.7	17.3
2	210 30.6	17.7
3	225 30.5	18.0
4	240 30.4	18.3
5	255 30.3	18.6
6	270 30.2	+22 18.9
7	285 30.1	19.2
8	300 30.0	19.5
9	315 29.9	19.8
10	330 29.8	20.1
11	345 29.7	20.4
12	0 29.6	+22 20.7
13	15 29.5	21.0
14	30 29.4	21.3
15	45 29.3	21.6
16	60 29.2	21.9
17	75 29.1	22.2
18	90 29.0	+22 22.5
19	105 28.9	22.8
20	120 28.7	23.1
21	135 28.6	23.4
22	150 28.5	23.7
23	165 28.4	24.0
4 0	180 28.3	+22 24.3
1	195 28.2	24.6
2	210 28.1	24.9
3	225 28.0	25.2
4	240 27.9	25.5
5	255 27.8	25.8
6	270 27.7	+22 26.1
7	285 27.6	26.4
8	300 27.5	26.7
9	315 27.4	26.9
10	330 27.3	27.2
11	345 27.2	27.5
12	0 27.0	+22 27.8
13	15 26.9	28.1
14	30 26.8	28.4
15	45 26.7	28.7
16	60 26.6	28.9
17	75 26.5	29.2
18	90 26.4	+22 29.5
19	105 26.3	29.8
20	120 26.2	30.1
21	135 26.1	30.4
22	150 26.0	30.6
23	165 25.9	30.9
24	180 25.7	+22 31.2
Mode	—	+ 3

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 51.1	−40 28.6
5	Achernar	335 58.9	−57 27.2
30	Acrux	173 56.9	−62 51.9
19	Adhara	255 46.5	−28 54.9
10	Aldebaran	291 38.8	+16 25.3
32	Alioth	166 57.8	+56 11.9
34	Alkaid	153 32.2	+49 31.9
55	Al Na'ir	28 37.2	−47 10.0
15	Alnilam	276 30.1	− 1 13.8
25	Alphard	218 38.2	− 8 28.3
41	Alphecca	126 46.9	+26 51.6
1	Alpheratz	358 27.9	+28 50.9
51	Altair	62 49.7	+ 8 45.2
2	Ankaa	353 58.0	−42 32.3
42	Antares	113 18.4	−26 20.3
37	Arcturus	146 34.5	+19 24.5
43	Atria	108 58.0	−68 57.0
22	Avior	234 36.0	−59 22.5
13	Bellatrix	279 18.2	+ 6 18.6
16	Betelg'se	271 47.9	+ 7 23.9
17	Canopus	264 15.7	−52 40.5
12	Capella	281 38.1	+45 57.3
53	Deneb	50 00.3	+45 07.3
28	Denebola	183 17.1	+14 48.9
4	Diphda	349 38.9	−18 13.4
27	Dubhe	194 44.0	+61 59.4
14	Elnath	279 07.1	+28 34.3
47	Eltanin	91 05.5	+51 29.6
54	Enif	34 29.0	+ 9 40.5
56	Fomalhaut	16 11.1	−29 51.0
31	Gacrux	172 48.4	−56 52.5
29	Gienah	176 36.2	−17 18.2
35	Hadar	149 48.2	−60 10.1
6	Hamal	328 49.3	+23 15.4
48	Kaus Aust.	84 40.1	−34 24.3
40	Kochab	137 17.0	+74 20.2
57	Markab	14 20.9	+14 58.2
8	Menkar	315 00.1	+ 3 55.2
36	Menkent	148 57.7	−36 09.6
24	Miapl'dus	221 49.3	−69 32.7
9	Mirfak	309 42.1	+49 42.4
50	Nunki	76 50.9	−26 21.0
52	Peacock	54 26.1	−56 52.3
21	Pollux	244 20.3	+28 08.0
20	Procyon	245 44.7	+ 5 20.2
46	R'alhague	96 45.8	+12 35.4
26	Regulus	208 29.1	+12 10.8
11	Rigel	281 53.5	− 8 15.1
38	Rigil Kent.	140 49.7	−60 39.7
44	Sabik	103 01.2	−15 40.4
3	Schedar	350 29.6	+56 17.7
45	Shaula	97 19.6	−37 04.4
18	Sirius	259 11.7	−16 39.5
33	Spica	159 16.1	−10 56.2
23	Suhail	223 24.1	−43 15.7
49	Vega	81 07.5	+38 44.5
39	Zub'g'bi	137 52.5	−15 51.8

GMT	Equation of Time (App − Mean) 2	3	4
h	m s	m s	m s
0	+ 2 13.0	+ 2 03.4	+ 1 53.5
6	+ 2 10.6	+ 2 01.0	+ 1 51.0
12	+ 2 08.2	+ 1 58.5	+ 1 48.4
18	+ 2 05.9	+ 1 56.0	+ 1 45.8
24	+ 2 03.4	+ 1 53.5	+ 1 43.2

Lat.	Sunrise	Twlt. begins
N °	h m	h m
72	□	□
70	□	□
68	□	□
66	1 03	////
64	1 53	////
62	2 24	////
60	2 46	////
58	3 05	////
56	3 20	////
54	3 33	////
52	3 44	////
50	3 54	////
45	4 15	1 51
40	4 32	2 33
35	4 47	3 02
30	4 59	3 24
20	5 20	3 57
10	5 38	4 21
0	5 54	4 40
10	6 11	4 56
20	6 28	5 10
30	6 49	5 23
35	7 00	5 30
40	7 14	5 36
45	7 29	5 44
50	7 49	5 50
52	7 58	5 53
54	8 08	5 56
56	8 20	6 00
58	8 34	6 03
60	8 50	6 07

Lat.	Sunset	Twlt. ends
N °	h m	h m
72	□	□
70	□	□
68	□	□
66	22 57	////
64	22 05	////
62	21 34	////
60	21 11	////
58	20 52	////
56	20 37	////
54	20 24	////
52	20 12	////
50	20 02	////
45	19 41	22 07
40	19 24	21 24
35	19 10	20 55
30	18 58	20 33
20	18 37	20 00
10	18 18	19 35
0	18 02	19 17
10	17 45	19 00
20	17 28	18 46
30	17 08	18 33
35	16 56	18 26
40	16 42	18 19
45	16 27	18 13
50	16 07	18 05
52	15 58	18 02
54	15 48	17 59
56	15 36	17 55
58	15 22	17 51
60	15 06	17 47

Moonrise	2	3	4	5
N °	h m	h m	h m	h m
72	0 30	10 15 / 123 59	23 39	23 06
70	0 28	0 19	10 10 / 123 59	23 45
68	0 27	0 23	0 19	0 15
66	0 25	0 26	0 26	0 28
64	0 24	0 28	0 33	0 40
62	0 23	0 30	0 38	0 49
60	0 22	0 32	0 43	0 57
58	0 21	0 34	0 48	1 04
56	0 20	0 35	0 52	1 11
54	0 20	0 37	0 55	1 16
52	0 19	0 38	0 58	1 21
50	0 18	0 39	1 01	1 26
45	0 17	0 41	1 07	1 36
40	0 16	0 43	1 13	1 45
35	0 15	0 45	1 17	1 52
30	0 15	0 47	1 21	1 59
20	0 13	0 50	1 28	2 10
10	0 12	0 52	1 34	2 20
0	0 11	0 55	1 40	2 29
10	0 10	0 57	1 46	2 39
20	0 09	1 00	1 53	2 49
30	0 07	1 03	2 00	3 00
35	0 07	1 04	2 04	3 07
40	0 06	1 06	2 09	3 15
45	0 05	1 09	2 15	3 24
50	0 04	1 11	2 22	3 35
52	0 03	1 13	2 25	3 40
54	0 03	1 14	2 28	3 46
56	0 02	1 16	2 32	3 52
58	0 01	1 18	2 37	3 59
60	0 00	1 19	2 42	4 07

Moonset	2	3	4	5
N °	h m	h m	h m	h m
72	12 42	14 33	16 32	18 52
70	12 41	14 24	16 13	18 14
68	12 40	14 17	15 59	17 48
66	12 39	14 11	15 47	17 29
64	12 39	14 06	15 37	17 13
62	12 38	14 02	15 29	17 00
60	12 38	13 58	15 21	16 49
58	12 37	13 55	15 15	16 39
56	12 37	13 52	15 10	16 31
54	12 36	13 49	15 05	16 23
52	12 36	13 47	15 00	16 17
50	12 36	13 45	14 56	16 11
45	12 35	13 40	14 47	15 58
40	12 35	13 36	14 40	15 47
35	12 34	13 33	14 34	15 38
30	12 34	13 30	14 29	15 30
20	12 33	13 25	14 19	15 17
10	12 32	13 20	14 11	15 05
0	12 32	13 16	14 03	14 54
10	12 31	13 12	13 56	14 43
20	12 30	13 08	13 47	14 31
30	12 29	13 03	13 38	14 18
35	12 29	13 00	13 33	14 10
40	12 29	12 56	13 27	14 01
45	12 28	12 53	13 20	13 51
50	12 27	12 48	13 11	13 39
52	12 27	12 46	13 07	13 33
54	12 26	12 44	13 03	13 27
56	12 26	12 41	12 59	13 20
58	12 26	12 38	12 53	13 12
60	12 25	12 35	12 47	13 03

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
2	6 21	13 56	5 27	17 04	23 02
3	7 05	13 51	5 26	17 01	22 58
4	7 52	13 47	5 24	16 57	22 53
5	8 41	13 42	5 22	16 54	22 49

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.1	0.4	0.2
30	0.1	0.3	0.1
45	0.1	0.3	0.1
60	0.1	0.2	0.1
75	0.1	0.1	0.0
90			

Moon's Lower Limb **Add**

Alt.	2	3	4
°	′	′	′
0	13.9	14.9	16.1
4	13.9	14.9	16.1
8	13.9	14.9	16.1
12	13.9	14.9	16.0
16	14.0	14.9	16.0
20	14.0	15.0	16.0
24	14.0	15.0	16.0
28	14.1	15.0	16.0
32	14.1	15.0	16.0
36	14.2	15.0	16.0
40	14.2	15.0	16.0
44	14.3	15.1	15.9
48	14.4	15.1	15.9
52	14.4	15.1	15.9
56	14.5	15.1	15.9
60	14.6	15.2	15.8
64	14.7	15.2	15.8
68	14.8	15.2	15.8
72	14.8	15.3	15.8
76	14.9	15.3	15.7
80	15.0	15.3	15.7
84	15.1	15.4	15.7
88	15.2	15.4	15.7
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	2	3	4
°	′	′	′
0	16.5	15.9	15.3
4	16.5	15.9	15.3
8	16.5	15.9	15.3
12	16.5	15.9	15.3
16	16.4	15.9	15.3
20	16.4	15.9	15.3
24	16.4	15.9	15.3
28	16.3	15.8	15.3
32	16.3	15.8	15.3
36	16.2	15.8	15.3
40	16.2	15.8	15.4
44	16.1	15.8	15.4
48	16.0	15.7	15.4
52	16.0	15.7	15.4
56	15.9	15.7	15.4
60	15.8	15.6	15.5
64	15.7	15.6	15.5
68	15.6	15.6	15.5
72	15.6	15.6	15.5
76	15.5	15.5	15.6
80	15.4	15.5	15.6
84	15.3	15.4	15.6
88	15.2	15.4	15.7
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.8 GHA	VENUS −3.8 Dec.	MARS −0.4 GHA	MARS −0.4 Dec.	JUPITER −1.5 GHA	JUPITER −1.5 Dec.	SATURN 0.3 GHA	SATURN 0.3 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
5 0	253 23.6	153 50.8	+24 48.7	279 23.4	−13 46.9	105 55.6	+14 12.8	16 43.7	−17 38.9	234 06.4	107	+12 14.7	+106
1	268 26.1	168 53.8	48.3	294 24.5	46.5	120 57.7	12.7	31 46.4	38.9	248 36.1	105	12 25.3	+106
2	283 28.6	183 56.7	47.8	309 25.6	46.1	135 59.9	12.5	46 49.0	38.8	263 05.6	105	12 35.9	+105
3	298 31.0	198 59.7	·· 47.4	324 26.7	·· 45.7	151 02.0	·· 12.4	61 51.6	·· 38.8	277 35.1	104	·12 46.4	+105
4	313 33.5	214 02.7	47.0	339 27.8	45.3	166 04.2	12.3	76 54.3	38.8	292 04.5	103	12 56.9	+104
5	328 36.0	229 05.6	46.6	354 28.9	44.9	181 06.3	12.2	91 56.9	38.7	306 33.8	102	13 07.3	+104
6	343 38.4	244 08.6	+24 46.2	9 30.0	−13 44.5	196 08.5	+14 12.1	106 59.6	−17 38.7	321 03.0	101	+13 17.7	+103
7	358 40.9	259 11.6	45.7	24 31.1	44.1	211 10.6	12.0	122 02.2	38.7	335 32.1	100	13 28.0	+103
8	13 43.3	274 14.6	45.3	39 32.2	43.7	226 12.8	11.9	137 04.9	38.6	350 01.1	99	13 38.3	+101
9	28 45.8	289 17.6	·· 44.9	54 33.3	·· 43.3	241 14.9	·· 11.8	152 07.5	·· 38.6	4 30.0	98	·13 48.4	+102
10	43 48.3	304 20.6	44.5	69 34.4	42.9	256 17.1	11.6	167 10.2	38.6	18 58.8	97	13 58.6	+100
11	58 50.7	319 23.6	44.1	84 35.5	42.5	271 19.2	11.5	182 12.8	38.5	33 27.5	97	14 08.6	+100
12	73 53.2	334 26.6	+24 43.7	99 36.6	−13 42.1	286 21.4	+14 11.4	197 15.4	−17 38.5	47 56.2	95	+14 18.6	+100
13	88 55.7	349 29.6	43.2	114 37.7	41.7	301 23.5	11.3	212 18.1	38.5	62 24.7	94	14 28.6	+ 98
14	103 58.1	4 32.7	42.8	129 38.8	41.3	316 25.7	11.2	227 20.7	38.4	76 53.1	93	14 38.4	+ 98
15	119 00.6	19 35.7	·· 42.4	144 39.9	·· 40.9	331 27.8	·· 11.1	242 23.4	·· 38.4	91 21.4	93	·14 48.2	+ 98
16	134 03.1	34 38.7	42.0	159 41.0	40.5	346 30.0	11.0	257 26.0	38.4	105 49.7	91	14 58.0	+ 96
17	149 05.5	49 41.8	41.5	174 42.1	40.1	1 32.1	10.8	272 28.7	38.3	120 17.8	90	15 07.6	+ 96
18	164 08.0	64 44.8	+24 41.1	189 43.2	−13 39.7	16 34.3	+14 10.7	287 31.3	−17 38.3	134 45.8	90	+15 17.2	+ 95
19	179 10.4	79 47.8	40.7	204 44.3	39.3	31 36.4	10.6	302 33.9	38.3	149 13.8	88	15 26.7	+ 94
20	194 12.9	94 50.9	40.3	219 45.4	38.9	46 38.6	10.5	317 36.6	38.2	163 41.6	87	15 36.1	+ 94
21	209 15.4	109 53.9	·· 39.8	234 46.6	·· 38.5	61 40.7	·· 10.4	332 39.2	·· 38.2	178 09.3	87	·15 45.5	+ 93
22	224 17.8	124 57.0	39.4	249 47.7	38.1	76 42.9	10.3	347 41.9	38.2	192 37.0	85	15 54.8	+ 92
23	239 20.3	140 00.1	39.0	264 48.8	37.8	91 45.0	10.2	2 44.5	38.1	207 04.5	84	16 04.0	+ 91
6 0	254 22.8	155 03.1	+24 38.6	279 49.9	−13 37.4	106 47.2	+14 10.0	17 47.2	−17 38.1	221 31.9	84	+16 13.1	+ 90
1	269 25.2	170 06.2	38.1	294 51.0	37.0	121 49.3	09.9	32 49.8	38.1	235 59.3	82	16 22.1	+ 90
2	284 27.7	185 09.3	37.7	309 52.1	36.6	136 51.4	09.8	47 52.5	38.0	250 26.5	81	16 31.1	+ 88
3	299 30.2	200 12.3	·· 37.3	324 53.2	·· 36.2	151 53.6	·· 09.7	62 55.1	·· 38.0	264 53.6	81	·16 39.9	+ 88
4	314 32.6	215 15.4	36.9	339 54.3	35.8	166 55.7	09.6	77 57.7	38.0	279 20.7	79	16 48.7	+ 87
5	329 35.1	230 18.5	36.4	354 55.4	35.4	181 57.9	09.5	93 00.4	37.9	293 47.6	78	16 57.4	+ 85
6	344 37.6	245 21.6	+24 36.0	9 56.5	−13 35.0	197 00.0	+14 09.4	108 03.0	−17 37.9	308 14.4	77	+17 05.9	+ 85
7	359 40.0	260 24.7	35.6	24 57.7	34.6	212 02.2	09.2	123 05.7	37.9	322 41.1	76	17 14.4	+ 84
8	14 42.5	275 27.8	35.1	39 58.8	34.2	227 04.3	09.1	138 08.3	37.8	337 07.7	76	17 22.8	+ 83
9	29 44.9	290 30.9	·· 34.7	54 59.9	·· 33.8	242 06.5	·· 09.0	153 11.0	·· 37.8	351 34.3	74	·17 31.1	+ 82
10	44 47.4	305 34.0	34.3	70 01.0	33.4	257 08.6	08.9	168 13.6	37.8	6 00.7	73	17 39.3	+ 81
11	59 49.9	320 37.1	33.8	85 02.1	33.0	272 10.8	08.8	183 16.2	37.7	20 27.0	72	17 47.4	+ 81
12	74 52.3	335 40.3	+24 33.4	100 03.2	−13 32.6	287 12.9	+14 08.7	198 18.9	−17 37.7	34 53.2	71	+17 55.5	+ 79
13	89 54.8	350 43.4	33.0	115 04.3	32.2	302 15.1	08.6	213 21.5	37.7	49 19.3	70	18 03.4	+ 78
14	104 57.3	5 46.5	32.5	130 05.5	31.8	317 17.2	08.4	228 24.2	37.6	63 45.3	70	18 11.2	+ 77
15	119 59.7	20 49.7	·· 32.1	145 06.6	·· 31.4	332 19.3	·· 08.3	243 26.8	·· 37.6	78 11.3	68	·18 18.9	+ 75
16	135 02.2	35 52.8	31.7	160 07.7	31.0	347 21.5	08.2	258 29.5	37.6	92 37.1	67	18 26.4	+ 75
17	150 04.7	50 55.9	31.2	175 08.8	30.6	2 23.6	08.1	273 32.1	37.5	107 02.8	66	18 33.9	+ 74
18	165 07.1	65 59.1	+24 30.8	190 09.9	−13 30.2	17 25.8	+14 08.0	288 34.7	−17 37.5	121 28.4	65	+18 41.3	+ 73
19	180 09.6	81 02.2	30.4	205 11.0	29.9	32 27.9	07.9	303 37.4	37.5	135 53.9	64	18 48.6	+ 71
20	195 12.1	96 05.4	29.9	220 12.2	29.5	47 30.1	07.8	318 40.0	37.4	150 19.3	64	18 55.7	+ 70
21	210 14.5	111 08.5	·· 29.5	235 13.3	·· 29.1	62 32.2	·· 07.6	333 42.7	·· 37.4	164 44.7	62	·19 02.7	+ 69
22	225 17.0	126 11.7	29.1	250 14.4	28.7	77 34.3	07.5	348 45.3	37.4	179 09.9	61	19 09.6	+ 68
23	240 19.4	141 14.9	28.6	265 15.5	28.3	92 36.5	07.4	3 47.9	37.3	193 35.0	61	19 16.4	+ 67
7 0	255 21.9	156 18.1	+24 28.2	280 16.6	−13 27.9	107 38.6	+14 07.3	18 50.6	−17 37.3	208 00.1	59	+19 23.1	+ 66
1	270 24.4	171 21.2	27.7	295 17.8	27.5	122 40.8	07.2	33 53.2	37.3	222 25.0	59	19 29.7	+ 64
2	285 26.8	186 24.4	27.3	310 18.9	27.1	137 42.9	07.1	48 55.9	37.2	236 49.9	57	19 36.1	+ 63
3	300 29.3	201 27.6	·· 26.9	325 20.0	·· 26.7	152 45.1	·· 06.9	63 58.5	·· 37.2	251 14.6	57	·19 42.4	+ 62
4	315 31.8	216 30.8	26.4	340 21.1	26.3	167 47.2	06.8	79 01.2	37.2	265 39.3	56	19 48.6	+ 61
5	330 34.2	231 34.0	26.0	355 22.2	25.9	182 49.3	06.7	94 03.8	37.1	280 03.9	55	19 54.7	+ 59
6	345 36.7	246 37.2	+24 25.5	10 23.4	−13 25.5	197 51.5	+14 06.6	109 06.4	−17 37.1	294 28.4	54	+20 00.6	+ 59
7	0 39.2	261 40.4	25.1	25 24.5	25.1	212 53.6	06.5	124 09.1	37.1	308 52.8	53	20 06.5	+ 56
8	15 41.6	276 43.6	24.6	40 25.6	24.7	227 55.8	06.4	139 11.7	37.0	323 17.1	52	20 12.1	+ 56
9	30 44.1	291 46.8	·· 24.2	55 26.7	·· 24.3	242 57.9	·· 06.2	154 14.4	·· 37.0	337 41.3	51	·20 17.7	+ 54
10	45 46.5	306 50.0	23.8	70 27.9	23.9	258 00.1	06.1	169 17.0	37.0	352 05.4	51	20 23.1	+ 53
11	60 49.0	321 53.3	23.3	85 29.0	23.6	273 02.2	06.0	184 19.6	36.9	6 29.5	49	20 28.4	+ 51
12	75 51.5	336 56.5	+24 22.9	100 30.1	−13 23.2	288 04.3	+14 05.9	199 22.3	−17 36.9	20 53.4	49	+20 33.5	+ 50
13	90 53.9	351 59.7	22.4	115 31.2	22.8	303 06.5	05.8	214 24.9	36.9	35 17.3	48	20 38.5	+ 49
14	105 56.4	7 03.0	22.0	130 32.4	22.4	318 08.6	05.7	229 27.6	36.8	49 41.1	48	20 43.4	+ 47
15	120 58.9	22 06.2	·· 21.5	145 33.5	·· 22.0	333 10.8	·· 05.5	244 30.2	·· 36.8	64 04.9	46	·20 48.1	+ 46
16	136 01.3	37 09.5	21.1	160 34.6	21.6	348 12.9	05.4	259 32.8	36.8	78 28.5	46	20 52.7	+ 45
17	151 03.8	52 12.7	20.6	175 35.7	21.2	3 15.0	05.3	274 35.5	36.7	92 52.1	45	20 57.2	+ 43
18	166 06.3	67 16.0	+24 20.2	190 36.9	−13 20.8	18 17.2	+14 05.2	289 38.1	−17 36.7	107 15.6	44	+21 01.5	+ 41
19	181 08.7	82 19.2	19.7	205 38.0	20.4	33 19.3	05.1	304 40.8	36.7	121 39.0	44	21 05.6	+ 41
20	196 11.2	97 22.5	19.3	220 39.1	20.0	48 21.5	05.0	319 43.4	36.7	136 02.4	42	21 09.7	+ 38
21	211 13.7	112 25.7	·· 18.8	235 40.2	·· 19.6	63 23.6	·· 04.8	334 46.1	·· 36.6	150 25.6	42	·21 13.5	+ 38
22	226 16.1	127 29.0	18.4	250 41.4	19.2	78 25.7	04.7	349 48.7	36.6	164 48.8	42	21 17.3	+ 35
23	241 18.6	142 32.3	17.9	265 42.5	18.8	93 27.9	04.6	4 51.3	36.6	179 12.0	41	21 20.8	+ 35
24	256 21.0	157 35.6	+24 17.5	280 43.6	−13 18.4	108 30.0	+14 04.5	19 54.0	−17 36.5	193 35.1	40	+21 24.3	+ 32
code	−	+ 31	− 4	+ 11	+ 4	+ 22	− 1	+ 26	0				

G M T	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
5 0	180 25.7	+22 31.2	7	Acamar	315 51.1	−40 28.6
1	195 25.6	31.5	5	Achernar	335 58.9	−57 27.2
2	210 25.5	31.8	30	Acrux	173 56.9	−62 51.9
3	225 25.4	·· 32.0	19	Adhara	255 46.5	−28 54.9
4	240 25.3	32.3	10	Aldebaran	291 38.8	+16 25.3
5	255 25.2	32.6				
6	270 25.1	+22 32.9	32	Alioth	166 57.9	+56 11.9
7	285 25.0	33.1	34	Alkaid	153 32.2	+49 31.9
8	300 24.9	33.4	55	Al Na'ir	28 37.2	−47 10.0
9	315 24.8	·· 33.7	15	Alnilam	276 30.1	− 1 13.8
10	330 24.6	34.0	25	Alphard	218 38.2	− 8 28.3
11	345 24.5	34.2				
12	0 24.4	+22 34.5	41	Alphecca	126 46.9	+26 51.6
13	15 24.3	34.8	1	Alpheratz	358 27.9	+28 50.9
14	30 24.2	35.0	51	Altair	62 49.7	+ 8 45.2
15	45 24.1	·· 35.3	2	Ankaa	353 58.0	−42 32.3
16	60 24.0	35.6	42	Antares	113 18.4	−26 20.3
17	75 23.9	35.8				
18	90 23.8	+22 36.1	37	Arcturus	146 34.5	+19 24.5
19	105 23.6	36.4	43	Atria	108 58.0	−68 57.1
20	120 23.5	36.6	22	Avior	234 36.0	−59 22.5
21	135 23.4	·· 36.9	13	Bellatrix	279 18.2	+ 6 18.6
22	150 23.3	37.2	16	Betelg'se	271 47.9	+ 7 24.0
23	165 23.2	37.4				
			17	Canopus	264 15.7	−52 40.4
6 0	180 23.1	+22 37.7	12	Capella	281 38.1	+45 57.3
1	195 23.0	38.0	53	Deneb	50 00.3	+45 07.3
2	210 22.9	38.2	28	Denebola	183 17.2	+14 48.9
3	225 22.7	·· 38.5	4	Diphda	349 38.9	−18 13.4
4	240 22.6	38.7				
5	255 22.5	39.0	27	Dubhe	194 44.0	+61 59.4
6	270 22.4	+22 39.3	14	Elnath	279 07.1	+28 34.3
7	285 22.3	39.5	47	Eltanin	91 05.5	+51 29.6
8	300 22.2	39.8	54	Enif	34 29.0	+ 9 40.5
9	315 22.1	·· 40.0	56	Fomalhaut	16 11.0	−29 51.0
10	330 22.0	40.3				
11	345 21.8	40.5	31	Gacrux	172 48.4	−56 52.5
12	0 21.7	+22 40.8	29	Gienah	176 36.2	−17 18.2
13	15 21.6	41.0	35	Hadar	149 48.2	−60 10.1
14	30 21.5	41.3	6	Hamal	328 49.3	+23 15.4
15	45 21.4	·· 41.6	48	Kaus Aust.	84 40.1	−34 24.3
16	60 21.3	41.8				
17	75 21.2	42.1	40	Kochab	137 17.0	+74 20.2
18	90 21.0	+22 42.3	57	Markab	14 20.9	+14 58.2
19	105 20.9	42.6	8	Menkar	315 00.1	+ 3 55.2
20	120 20.8	42.8	36	Menkent	148 57.7	−36 09.6
21	135 20.7	·· 43.1	24	Miapl'dus	221 49.3	−69 32.7
22	150 20.6	43.3				
23	165 20.5	43.6	9	Mirfak	309 42.1	+49 42.3
			50	Nunki	76 50.9	−26 21.0
7 0	180 20.3	+22 43.8	52	Peacock	54 26.1	−56 52.3
1	195 20.2	44.0	21	Pollux	244 20.3	+28 08.0
2	210 20.1	44.3	20	Procyon	245 44.7	+ 5 20.2
3	225 20.0	·· 44.5				
4	240 19.9	44.8	46	R'alhague	96 45.8	+12 35.4
5	255 19.8	45.0	26	Regulus	208 29.1	+12 10.8
6	270 19.6	+22 45.3	11	Rigel	281 53.5	− 8 15.1
7	285 19.5	45.5	38	Rigil Kent.	140 49.7	−60 39.7
8	300 19.4	45.7	44	Sabik	103 01.2	−15 40.4
9	315 19.3	·· 46.0				
10	330 19.2	46.2	3	Schedar	350 29.6	+56 17.7
11	345 19.1	46.5	45	Shaula	97 19.6	−37 04.4
12	0 18.9	+22 46.7	18	Sirius	259 11.7	−16 39.4
13	15 18.8	46.9	33	Spica	159 16.1	−10 56.2
14	30 18.7	47.2	23	Suhail	223 24.2	−43 15.7
15	45 18.6	·· 47.4				
16	60 18.5	47.6	49	Vega	81 07.5	+38 44.5
17	75 18.3	47.9	39	Zub'g'bi	137 52.5	−15 51.8
18	90 18.2	+22 48.1				
19	105 18.1	48.3				
20	120 18.0	48.6				
21	135 17.9	·· 48.8				
22	150 17.8	49.0				
23	165 17.6	49.3				
24	180 17.5	+22 49.5				
code	—	+ 2				

Lat.	Sunrise	Twlt. begins
N °	h m	h m
72	□	□
70	□	□
68	□	□
66	0 49	////
64	1 46	////
62	2 19	////
60	2 43	////
58	3 02	////
56	3 17	////
54	3 31	////
52	3 42	////
50	3 53	////
45	4 14	1 47
40	4 31	2 31
35	4 46	3 01
30	4 58	3 24
20	5 20	3 57
10	5 38	4 21
0	5 55	4 40
10	6 12	4 56
20	6 30	5 11
30	6 50	5 25
35	7 02	5 32
40	7 15	5 38
45	7 32	5 45
50	7 51	5 53
52	8 01	5 56
54	8 11	5 59
56	8 23	6 03
58	8 37	6 06
60	8 54	6 10
S		

Moonrise	5	6	7	8
N °	h m	h m	h m	h m
72	23 06	□	□	□
70	23 45	23 16	□	□
68	0 15	0 12	0 09	0 09
66	0 28	0 33	0 42	1 04
64	0 40	0 50	1 06	1 37
62	0 49	1 03	1 26	2 02
60	0 57	1 15	1 42	2 21
58	1 04	1 26	1 55	2 37
56	1 11	1 35	2 07	2 51
54	1 16	1 43	2 17	3 03
52	1 21	1 50	2 26	3 13
50	1 26	1 56	2 34	3 23
45	1 36	2 10	2 52	3 43
40	1 45	2 22	3 06	3 59
35	1 52	2 32	3 18	4 13
30	1 59	2 41	3 29	4 25
20	2 10	2 56	3 48	4 45
10	2 20	3 09	4 04	5 03
0	2 29	3 22	4 19	5 20
10	2 39	3 35	4 34	5 36
20	2 49	3 48	4 50	5 54
30	3 00	4 04	5 09	6 15
35	3 07	4 13	5 20	6 27
40	3 15	4 23	5 33	6 41
45	3 24	4 36	5 48	6 58
50	3 35	4 51	6 07	7 19
52	3 40	4 58	6 15	7 28
54	3 46	5 06	6 25	7 39
56	3 52	5 14	6 36	7 52
58	3 59	5 24	6 49	8 07
60	4 07	5 36	7 04	8 24

Lat.	Sunset	Twlt. ends
N °	h m	h m
72	□	□
70	□	□
68	□	□
66	23 13	////
64	22 13	////
62	21 40	////
60	21 15	////
58	20 56	////
56	20 41	////
54	20 27	////
52	20 15	////
50	20 05	////
45	19 43	22 11
40	19 26	21 27
35	19 12	20 58
30	18 59	20 35
20	18 38	20 01
10	18 19	19 36
0	18 02	19 17
10	17 45	19 00
20	17 28	18 46
30	17 07	18 32
35	16 55	18 25
40	16 42	18 19
45	16 25	18 11
50	16 06	18 04
52	15 56	18 01
54	15 46	17 58
56	15 34	17 54
58	15 20	17 50
60	15 03	17 46
S		

Moonset	5	6	7	8
N °	h m	h m	h m	h m
72	18 52	□	□	□
70	18 14	20 40	□	□
68	17 48	19 47	21 53	23 34
66	17 29	19 15	20 58	22 18
64	17 13	18 51	20 25	21 41
62	17 00	18 32	20 01	21 14
60	16 49	18 17	19 41	20 54
58	16 39	18 04	19 25	20 36
56	16 31	17 53	19 12	20 22
54	16 23	17 43	19 00	20 10
52	16 17	17 34	18 50	19 59
50	16 11	17 26	18 41	19 49
45	15 58	17 10	18 21	19 28
40	15 47	16 56	18 06	19 12
35	15 38	16 45	17 52	18 58
30	15 30	16 35	17 41	18 46
20	15 17	16 17	17 21	18 25
10	15 05	16 02	17 03	18 06
0	14 54	15 48	16 47	17 49
10	14 43	15 34	16 31	17 32
20	14 31	15 20	16 14	17 14
30	14 18	15 02	15 54	16 53
35	14 10	14 53	15 43	16 41
40	14 01	14 41	15 29	16 27
45	13 51	14 28	15 14	16 10
50	13 39	14 12	14 55	15 49
52	13 33	14 04	14 46	15 39
54	13 27	13 56	14 35	15 28
56	13 20	13 47	14 24	15 15
58	13 12	13 36	14 11	15 01
60	13 03	13 24	13 55	14 43

G M T	Equation of Time (App.—Mean) 5	6	7
h	m s	m s	m s
0	+ 1 43.2	+ 1 32.6	+ 1 21.6
6	+ 1 40.6	+ 1 29.9	+ 1 18.8
12	+ 1 37.9	+ 1 27.1	+ 1 16.0
18	+ 1 35.3	+ 1 24.4	+ 1 13.2
24	+ 1 32.6	+ 1 21.6	+ 1 10.3

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
5	8 41	13 42	5 22	16 54	22 49
6	9 35	13 37	5 20	16 50	22 45
7	10 33	13 32	5 19	16 47	22 41
8	11 34	13 27	5 17	16 44	22 36

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb **Add**	Venus **Add**	Mars **Add**
°	′	′	′
0	0.1	0.4	0.2
30	0.1	0.4	0.1
45	0.1	0.3	0.1
60	0.1	0.2	0.1
75	0.1	0.1	0.0
90			

Moon's Lower Limb **Add**

Alt.	5	6	7
°	′	′	′
0	17.2	18.3	19.4
4	17.2	18.3	19.4
8	17.2	18.3	19.3
12	17.2	18.3	19.3
16	17.1	18.2	19.2
20	17.1	18.2	19.2
24	17.1	18.1	19.1
28	17.0	18.1	19.0
32	17.0	18.0	18.9
36	16.9	17.9	18.7
40	16.9	17.8	18.6
44	16.8	17.7	18.5
48	16.7	17.6	18.3
52	16.7	17.4	18.1
56	16.6	17.3	18.0
60	16.5	17.2	17.8
64	16.4	17.0	17.6
68	16.4	16.9	17.4
72	16.3	16.8	17.2
76	16.2	16.6	17.0
80	16.1	16.5	16.8
84	16.0	16.3	16.6
88	15.9	16.2	16.4
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	5	6	7
°	′	′	′
0	14.6	14.0	13.4
4	14.6	14.0	13.4
8	14.6	14.0	13.4
12	14.6	14.0	13.5
16	14.7	14.1	13.5
20	14.7	14.1	13.6
24	14.7	14.2	13.7
28	14.8	14.2	13.8
32	14.8	14.3	13.9
36	14.9	14.4	14.0
40	14.9	14.5	14.1
44	15.0	14.6	14.3
48	15.1	14.7	14.4
52	15.1	14.9	14.6
56	15.2	15.0	14.8
60	15.3	15.1	15.0
64	15.4	15.3	15.1
68	15.5	15.4	15.3
72	15.5	15.5	15.5
76	15.6	15.7	15.7
80	15.7	15.8	15.9
84	15.8	16.0	16.2
88	15.9	16.1	16.3
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.7 GHA	VENUS −3.7 Dec	MARS −0.5 GHA	MARS −0.5 Dec.	JUPITER −1.5 GHA	JUPITER −1.5 Dec.	SATURN 0.3 GHA	SATURN 0.3 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
8 00	256 21.0	157 35.6	+24 17.5	280 43.6	−13 18.4	108 30.0	+14 04.5	19 54.0	−17 36.5	193 35.1	40	+21 24.3	+ 32
01	271 23.5	172 38.9	17.0	295 44.8	18.1	123 32.1	04.4	34 56.6	36.5	207 58.1	39	21 27.5	+ 31
02	286 26.0	187 42.1	16.6	310 45.9	17.7	138 34.3	04.3	49 59.3	36.5	222 21.0	39	21 30.6	+ 30
03	301 28.4	202 45.4	16.1	325 47.0	17.3	153 36.4	04.1	65 01.9	36.4	236 43.9	39	·21 33.6	+ 28
04	316 30.9	217 48.7	15.7	340 48.2	16.9	168 38.6	04.0	80 04.5	36.4	251 06.8	38	21 36.4	+ 27
05	331 33.4	232 52.0	15.2	355 49.3	16.5	183 40.7	03.9	95 07.2	36.4	265 29.6	37	21 39.1	+ 25
06	346 35.8	247 55.3	+24 14.8	10 50.4	−13 16.1	198 42.8	+14 03.8	110 09.8	−17 36.3	279 52.3	37	+21 41.6	+ 24
07	1 38.3	262 58.7	14.3	25 51.6	15.7	213 45.0	03.7	125 12.5	36.3	294 15.0	36	21 44.0	+ 21
08	16 40.8	278 02.0	13.9	40 52.7	15.3	228 47.1	03.6	140 15.1	36.3	308 37.6	36	21 46.1	+ 21
09	31 43.2	293 05.3	13.4	55 53.8	14.9	243 49.2	03.4	155 17.7	36.2	323 00.2	35	·21 48.2	+ 19
10	46 45.7	308 08.6	12.9	70 55.0	14.5	258 51.4	03.3	170 20.4	36.2	337 22.7	35	21 50.1	+ 17
11	61 48.2	323 11.9	12.5	85 56.1	14.1	273 53.5	03.2	185 23.0	36.2	351 45.2	34	21 51.8	+ 15
12	76 50.6	338 15.3	+24 12.0	100 57.2	−13 13.7	288 55.6	+14 03.1	200 25.6	−17 36.1	6 07.6	34	+21 53.3	+ 14
13	91 53.1	353 18.6	11.6	115 58.4	13.4	303 57.8	03.0	215 28.3	36.1	20 30.0	34	21 54.7	+ 13
14	106 55.5	8 22.0	11.1	130 59.5	13.0	318 59.9	02.8	230 30.9	36.1	34 52.4	33	21 56.0	+ 11
15	121 58.0	23 25.3	10.7	146 00.6	12.6	334 02.1	02.7	245 33.6	36.0	49 14.7	33	·21 57.1	+ 9
16	137 00.5	38 28.7	10.2	161 01.8	12.2	349 04.2	02.6	260 36.2	36.0	63 37.0	32	21 58.0	+ 7
17	152 02.9	53 32.0	09.7	176 02.9	11.8	4 06.3	02.5	275 38.8	36.0	77 59.2	33	21 58.7	+ 6
18	167 05.4	68 35.4	+24 09.3	191 04.0	−13 11.4	19 08.5	+14 02.4	290 41.5	−17 35.9	92 21.5	32	+21 59.3	+ 4
19	182 07.9	83 38.7	08.8	206 05.2	11.0	34 10.6	02.2	305 44.1	35.9	106 43.7	32	21 59.7	+ 3
20	197 10.3	98 42.1	08.4	221 06.3	10.6	49 12.7	02.1	320 46.8	35.9				
21	212 12.8	113 45.5	07.9	236 07.5	10.2	64 14.9	02.0	335 49.4	35.8	Eclipse of the Sun June 8,			
22	227 15.3	128 48.8	07.4	251 08.6	09.8	79 17.0	01.9	350 52.0	35.8	visible in the south Pacific			
23	242 17.7	143 52.2	07.0	266 09.7	09.5	94 19.1	01.8	5 54.7	35.8	region.			
9 00	257 20.2	158 55.6	+24 06.5	281 10.9	−13 09.1	109 21.3	+14 01.7	20 57.3	−17 35.8	178 34.4	31	+21 59.4	− 6
01	272 22.6	173 59.0	06.0	296 12.0	08.7	124 23.4	01.5	36 00.0	35.7	192 56.5	30	21 58.8	− 7
02	287 25.1	189 02.4	05.6	311 13.1	08.3	139 25.5	01.4	51 02.6	35.7	207 18.5	31	21 58.1	− 9
03	302 27.6	204 05.8	05.1	326 14.3	07.9	154 27.7	01.3	66 05.2	35.7	221 40.6	31	·21 57.2	− 10
04	317 30.0	219 09.2	04.6	341 15.4	07.5	169 29.8	01.2	81 07.9	35.6	236 02.7	30	21 56.2	− 12
05	332 32.5	234 12.6	04.2	356 16.6	07.1	184 31.9	01.1	96 10.5	35.6	250 24.7	31	21 55.0	− 14
06	347 35.0	249 16.0	+24 03.7	11 17.7	−13 06.7	199 34.1	+14 00.9	111 13.1	−17 35.6	264 46.8	30	+21 53.6	− 16
07	2 37.4	264 19.4	03.2	26 18.9	06.3	214 36.2	00.8	126 15.8	35.5	279 08.8	31	21 52.0	− 17
08	17 39.9	279 22.8	02.8	41 20.0	05.9	229 38.3	00.7	141 18.4	35.5	293 30.9	30	21 50.3	− 19
09	32 42.4	294 26.3	02.3	56 21.1	05.6	244 40.5	00.6	156 21.1	35.5	307 52.9	31	·21 48.4	− 20
10	47 44.8	309 29.7	01.8	71 22.3	05.2	259 42.6	00.5	171 23.7	35.4	322 15.0	31	21 46.4	− 22
11	62 47.3	324 33.1	01.4	86 23.4	04.8	274 44.7	00.3	186 26.3	35.4	336 37.1	31	21 44.2	− 24
12	77 49.8	339 36.5	+24 00.9	101 24.6	−13 04.4	289 46.9	+14 00.2	201 29.0	−17 35.4	350 59.2	31	+21 41.8	− 25
13	92 52.2	354 40.0	00.4	116 25.7	04.0	304 49.0	00.1	216 31.6	35.3	5 21.3	31	21 39.3	− 27
14	107 54.7	9 43.4	24 00.0	131 26.9	03.6	319 51.1	14 00.0	231 34.2	35.3	19 43.4	31	21 36.6	− 29
15	122 57.1	24 46.9	·23 59.5	146 28.0	03.2	334 53.2	·13 59.9	246 36.9	35.3	34 05.5	32	·21 33.7	− 30
16	137 59.6	39 50.3	59.0	161 29.2	02.8	349 55.4	59.7	261 39.5	35.2	48 27.7	31	21 30.7	− 32
17	153 02.1	54 53.8	58.6	176 30.3	02.4	4 57.5	59.6	276 42.2	35.2	62 49.8	32	21 27.5	− 33
18	168 04.5	69 57.2	+23 58.1	191 31.5	−13 02.1	19 59.6	+13 59.5	291 44.8	−17 35.2	77 12.0	33	+21 24.2	− 35
19	183 07.0	85 00.7	57.6	206 32.6	01.7	35 01.8	59.4	306 47.4	35.2	91 34.3	32	21 20.7	− 37
20	198 09.5	100 04.2	57.1	221 33.8	01.3	50 03.9	59.3	321 50.1	35.1	105 56.5	33	21 17.0	− 38
21	213 11.9	115 07.6	56.7	236 34.9	00.9	65 06.0	59.1	336 52.7	35.1	120 18.8	33	·21 13.2	− 40
22	228 14.4	130 11.1	56.2	251 36.1	00.5	80 08.2	59.0	351 55.3	35.1	134 41.1	34	21 09.2	− 41
23	243 16.9	145 14.6	55.7	266 37.2	13 00.1	95 10.3	58.9	6 58.0	35.0	149 03.5	34	21 05.1	− 43
10 00	258 19.3	160 18.1	+23 55.2	281 38.4	−12 59.7	110 12.4	+13 58.8	22 00.6	−17 35.0	163 25.9	34	+21 00.8	− 45
01	273 21.8	175 21.6	54.8	296 39.5	59.3	125 14.5	58.6	37 03.2	35.0	177 48.3	34	20 56.3	− 46
02	288 24.3	190 25.1	54.3	311 40.7	58.9	140 16.7	58.5	52 05.9	34.9	192 10.7	35	20 51.7	− 47
03	303 26.7	205 28.6	53.8	326 41.8	58.6	155 18.8	58.4	67 08.5	34.9	206 33.2	36	·20 47.0	− 50
04	318 29.2	220 32.1	53.3	341 43.0	58.2	170 20.9	58.3	82 11.2	34.9	220 55.8	36	20 42.0	− 50
05	333 31.6	235 35.6	52.8	356 44.1	57.8	185 23.1	58.2	97 13.8	34.8	235 18.4	36	20 37.0	− 52
06	348 34.1	250 39.1	+23 52.4	11 45.3	−12 57.4	200 25.2	+13 58.0	112 16.4	−17 34.8	249 41.0	37	+20 31.8	− 54
07	3 36.6	265 42.6	51.9	26 46.4	57.0	215 27.3	57.9	127 19.1	34.8	264 03.7	38	20 26.4	− 55
08	18 39.0	280 46.1	51.4	41 47.6	56.6	230 29.4	57.8	142 21.7	34.7	278 26.5	38	20 20.9	− 57
09	33 41.5	295 49.6	50.9	56 48.7	56.2	245 31.6	57.7	157 24.3	34.7	292 49.3	38	·20 15.2	− 58
10	48 44.0	310 53.2	50.5	71 49.9	55.9	260 33.7	57.6	172 27.0	34.7	307 12.1	40	20 09.4	− 60
11	63 46.4	325 56.7	50.0	86 51.0	55.5	275 35.8	57.4	187 29.6	34.7	321 35.1	39	20 03.4	− 61
12	78 48.9	341 00.2	+23 49.5	101 52.2	−12 55.1	290 37.9	+13 57.3	202 32.2	−17 34.6	335 58.0	40	+19 57.3	− 62
13	93 51.4	356 03.8	49.0	116 53.3	54.7	305 40.1	57.2	217 34.9	34.6	350 21.0	41	19 51.1	− 64
14	108 53.8	11 07.3	48.5	131 54.5	54.3	320 42.2	57.1	232 37.5	34.6	4 44.1	42	19 44.7	− 66
15	123 56.3	26 10.9	48.0	146 55.7	53.9	335 44.3	56.9	247 40.2	34.5	19 07.3	42	·19 38.1	− 67
16	138 58.8	41 14.4	47.6	161 56.8	53.5	350 46.4	56.8	262 42.8	34.5	33 30.5	43	19 31.4	− 68
17	154 01.2	56 18.0	47.1	176 58.0	53.1	5 48.6	56.7	277 45.4	34.5	47 53.8	43	19 24.6	− 69
18	169 03.7	71 21.5	+23 46.6	191 59.1	−12 52.8	20 50.7	+13 56.6	292 48.1	−17 34.4	62 17.1	44	+19 17.7	− 71
19	184 06.1	86 25.1	46.1	207 00.3	52.4	35 52.8	56.5	307 50.7	34.4	76 40.5	45	19 10.6	− 72
20	199 08.6	101 28.6	45.6	222 01.4	52.0	50 54.9	56.3	322 53.3	34.4	91 04.0	46	19 03.4	− 74
21	214 11.1	116 32.2	45.1	237 02.6	51.6	65 57.1	56.2	337 56.0	34.3	105 27.6	46	·18 56.0	− 75
22	229 13.5	131 35.8	44.6	252 03.8	51.2	80 59.2	56.1	352 58.6	34.3	119 51.2	47	18 48.5	− 76
23	244 16.0	146 39.4	44.2	267 04.9	50.8	96 01.3	56.0	8 01.2	34.3	134 14.9	48	18 40.9	− 78
24	259 18.5	161 42.9	+23 43.7	282 06.1	−12 50.4	111 03.4	+13 55.8	23 03.9	−17 34.3	148 38.7	48	+18 33.1	− 79
code	—	+ 35	− 5	+ 11	+ 4	+ 21	− 1	+ 26	+ 1				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
8 00	180 17.5	+22 49.5	7	Acamar	315 51.1	−40 28.6
01	195 17.4	49.7	5	Achernar	335 58.9	−57 27.2
02	210 17.3	50.0	30	Acrux	173 56.9	−62 51.9
03	225 17.2	•• 50.2	19	Adhara	255 46.5	−28 54.9
04	240 17.0	50.4	10	Aldebaran	291 38.8	+16 25.3
05	255 16.9	50.6				
06	270 16.8	+22 50.9	32	Alioth	166 57.9	+56 11.9
07	285 16.7	51.1	34	Alkaid	153 32.2	+49 31.9
08	300 16.6	51.3	55	Al Na'ir	28 37.2	−47 10.0
09	315 16.4	•• 51.5	15	Alnilam	276 30.1	− 1 13.8
10	330 16.3	51.8	25	Alphard	218 38.2	− 8 28.3
11	345 16.2	52.0				
12	0 16.1	+22 52.2	41	Alphecca	126 46.9	+26 51.7
13	15 16.0	52.4	1	Alpheratz	358 27.9	+28 50.9
14	30 15.8	52.6	51	Altair	62 49.6	+ 8 45.2
15	45 15.7	•• 52.9	2	Ankaa	353 57.9	−42 32.2
16	60 15.6	53.1	42	Antares	113 18.3	−26 20.3
17	75 15.5	53.3				
18	90 15.4	+22 53.5	37	Arcturus	146 34.5	+19 24.5
19	105 15.2	53.7	43	Atria	108 58.0	−68 57.1
20	120 15.1	53.9	22	Avior	234 36.0	−59 22.5
21	135 15.0	•• 54.2	13	Bellatrix	279 18.2	+ 6 18.6
22	150 14.9	54.4	16	Betelg'se	271 47.9	+ 7 24.0
23	165 14.7	54.6				
			17	Canopus	264 15.7	−52 40.4
9 00	180 14.6	+22 54.8	12	Capella	281 38.1	+45 57.3
01	195 14.5	55.0	53	Deneb	50 00.3	+45 07.4
02	210 14.4	55.2	28	Denebola	183 17.2	+14 48.9
03	225 14.3	•• 55.4	4	Diphda	349 38.9	−18 13.4
04	240 14.1	55.6				
05	255 14.0	55.9	27	Dubhe	194 44.1	+61 59.4
06	270 13.9	+22 56.1	14	Elnath	279 07.1	+28 34.3
07	285 13.8	56.3	47	Eltanin	91 05.5	+51 29.6
08	300 13.6	56.5	54	Enif	34 28.9	+ 9 40.5
09	315 13.5	•• 56.7	56	Fomalhaut	16 11.0	−29 50.9
10	330 13.4	56.9				
11	345 13.3	57.1	31	Gacrux	172 48.4	−56 52.5
12	0 13.2	+22 57.3	29	Gienah	176 36.2	−17 18.2
13	15 13.0	57.5	35	Hadar	149 48.2	−60 10.1
14	30 12.9	57.7	6	Hamal	328 49.3	+23 15.4
15	45 12.8	•• 57.9	48	Kaus Aust.	84 40.1	−34 24.3
16	60 12.7	58.1				
17	75 12.5	58.3	40	Kochab	137 17.0	+74 20.2
18	90 12.4	+22 58.5	57	Markab	14 20.9	+14 58.2
19	105 12.3	58.7	8	Menkar	315 00.0	+ 3 55.2
20	120 12.2	58.9	36	Menkent	148 57.8	−36 09.6
21	135 12.0	•• 59.1	24	Miapl'dus	221 49.4	−69 32.6
22	150 11.9	59.3				
23	165 11.8	59.5	9	Mirfak	309 42.1	+49 42.3
			50	Nunki	76 50.9	−26 21.0
10 00	180 11.7	+22 59.7	52	Peacock	54 26.0	−56 52.3
01	195 11.5	22 59.9	21	Pollux	244 20.3	+28 08.0
02	210 11.4	23 00.1	20	Procyon	245 44.7	+ 5 20.2
03	225 11.3	•• 00.3				
04	240 11.2	00.5	46	R'alhague	96 45.8	+12 35.4
05	255 11.0	00.7	26	Regulus	208 29.1	+12 10.8
06	270 10.9	+23 00.9	11	Rigel	281 53.5	− 8 15.1
07	285 10.8	01.0	38	Rigil Kent.	140 49.7	−60 39.7
08	300 10.7	01.2	44	Sabik	103 01.2	−15 40.3
09	315 10.5	•• 01.4				
10	330 10.4	01.6	3	Schedar	350 29.5	+56 17.7
11	345 10.3	01.8	45	Shaula	97 19.5	−37 04.4
12	0 10.2	+23 02.0	18	Sirius	259 11.7	−16 39.4
13	15 10.0	02.2	33	Spica	159 16.2	−10 56.2
14	30 09.9	02.4	23	Suhail	223 24.2	−43 15.7
15	45 09.8	•• 02.5				
16	60 09.7	02.7	49	Vega	81 07.5	+38 44.5
17	75 09.5	02.9	39	Zub'g'bi	137 52.5	−15 51.8
18	90 09.4	+23 03.1				
19	105 09.3	03.3				
20	120 09.2	03.5				
21	135 09.0	•• 03.6				
22	150 08.9	03.8				
23	165 08.8	04.0				
24	180 08.7	+23 04.2				
code	—	+ 2				

GMT	Equation of Time (App.—Mean) 8	9	10
h	m s	m s	m s
0	+ 1 10.3	+ 0 58.8	+ 0 46.9
6	+ 1 07.4	+ 0 55.8	+ 0 43.9
12	+ 1 04.6	+ 0 52.9	+ 0 40.9
18	+ 1 01.7	+ 0 49.9	+ 0 37.9
24	+ 0 58.8	+ 0 46.9	+ 0 34.9

Lat.	Sunrise	Twlt. begins	Moonrise 8	9	10	11
N °	h m	h m	h m	h m	h m	h m
72	□	□	□	□	□	□
70	□	□	□	□	□	4 07
68	□	□	0 09	0 39	2 38	4 48
66	0 34	////	1 04	1 55	3 25	5 15
64	1 41	////	1 37	2 32	3 55	5 36
62	2 15	////	2 02	2 58	4 18	5 54
60	2 40	////	2 21	3 19	4 37	6 08
58	2 59	////	2 37	3 36	4 52	6 20
56	3 15	////	2 51	3 50	5 05	6 30
54	3 29	////	3 03	4 03	5 16	6 39
52	3 41	////	3 13	4 14	5 26	6 47
50	3 51	////	3 23	4 23	5 35	6 54
45	4 13	1 44	3 43	4 44	5 54	7 10
40	4 31	2 29	3 59	5 01	6 09	7 23
35	4 45	3 00	4 13	5 15	6 22	7 33
30	4 58	3 22	4 25	5 27	6 34	7 43
20	5 20	3 56	4 45	5 48	6 53	7 59
10	5 38	4 21	5 03	6 06	7 10	8 13
0	5 55	4 40	5 20	6 23	7 26	8 26
10	6 13	4 57	5 36	6 40	7 41	8 40
20	6 31	5 12	5 54	6 58	7 58	8 54
30	6 51	5 26	6 15	7 19	8 17	9 09
35	7 03	5 33	6 27	7 31	8 28	9 19
40	7 17	5 40	6 41	7 45	8 41	9 29
45	7 34	5 47	6 58	8 02	8 56	9 42
50	7 54	5 54	7 19	8 22	9 15	9 57
52	8 04	5 58	7 28	8 32	9 24	10 04
54	8 14	6 01	7 39	8 43	9 33	10 11
56	8 27	6 05	7 52	8 55	9 44	10 20
58	8 41	6 09	8 07	9 10	9 57	10 30
60 S	8 57	6 12	8 24	9 27	10 11	10 41

Lat.	Sunset	Twlt. ends	Moonset 8	9	10	11
N °	h m	h m	h m	h m	h m	h m
72	□	□	□	□	□	□
70	□	□	□	□	□	0 29
68	□	□	23 34	23 48	23 47	23 44
66	23 31	////	22 18	23 00	23 18	23 26
64	22 19	////	21 41	22 29	22 56	23 12
62	21 44	////	21 14	22 06	22 39	22 59
60	21 19	////	20 54	21 47	22 24	22 49
58	21 00	////	20 36	21 32	22 11	22 39
56	20 44	////	20 22	21 18	22 00	22 31
54	20 30	////	20 10	21 07	21 51	22 24
52	20 18	////	19 59	20 57	21 42	22 18
50	20 07	////	19 49	20 47	21 34	22 12
45	19 45	22 15	19 28	20 28	21 18	21 59
40	19 28	21 30	19 12	20 12	21 04	21 49
35	19 13	20 59	18 58	19 59	20 53	21 40
30	19 00	20 36	18 46	19 47	20 42	21 32
20	18 39	20 03	18 25	19 27	20 25	21 18
10	18 20	19 37	18 06	19 09	20 09	21 06
0	18 03	19 18	17 49	18 53	19 55	20 54
10	17 46	19 01	17 32	18 36	19 40	20 42
20	17 28	18 46	17 14	18 18	19 25	20 30
30	17 07	18 32	16 53	17 58	19 06	20 16
35	16 55	18 25	16 41	17 46	18 56	20 07
40	16 41	18 18	16 27	17 32	18 44	19 57
45	16 25	18 11	16 10	17 16	18 29	19 46
50	16 04	18 03	15 49	16 56	18 12	19 32
52	15 55	18 00	15 39	16 46	18 03	19 26
54	15 44	17 56	15 28	16 35	17 54	19 19
56	15 32	17 53	15 15	16 23	17 43	19 11
58	15 18	17 49	15 01	16 08	17 31	19 02
60 S	15 01	17 45	14 43	15 52	17 17	18 51

DAY	GMT of Transit Meridian of Greenwich Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
8	11 34	13 27	5 17	16 44	22 36
9	12 38	13 21	5 15	16 40	22 32
10	13 40	13 16	5 13	16 37	22 28
11	14 40	13 10	5 11	16 33	22 24

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.1	0.4	0.2
30	0.1	0.4	0.2
45	0.1	0.3	0.1
60	0.1	0.2	0.1
75	0.1	0.1	0.0
90			

Moon's Lower Limb **Add**

Alt.	8	9	10
°	′	′	′
0	20.1	20.5	20.5
4	20.1	20.5	20.5
8	20.1	20.5	20.5
12	20.0	20.4	20.4
16	20.0	20.3	20.3
20	19.9	20.2	20.2
24	19.8	20.1	20.1
28	19.7	20.0	20.0
32	19.5	19.8	19.8
36	19.4	19.7	19.7
40	19.2	19.5	19.5
44	19.0	19.3	19.3
48	18.8	19.1	19.1
52	18.6	18.9	18.9
56	18.4	18.7	18.7
60	18.2	18.4	18.4
64	18.0	18.2	18.2
68	17.8	17.9	17.9
72	17.5	17.7	17.7
76	17.3	17.4	17.4
80	17.0	17.2	17.2
84	16.8	16.9	16.9
88	16.6	16.7	16.7
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	8	9	10
°	′	′	′
0	12.9	12.7	12.7
4	13.0	12.7	12.7
8	13.0	12.8	12.8
12	13.0	12.8	12.8
16	13.1	12.9	12.9
20	13.2	13.0	13.0
24	13.3	13.1	13.1
28	13.4	13.2	13.2
32	13.5	13.4	13.4
36	13.7	13.5	13.5
40	13.9	13.7	13.7
44	14.0	13.9	13.9
48	14.2	14.1	14.1
52	14.4	14.3	14.3
56	14.6	14.5	14.5
60	14.8	14.8	14.8
64	15.1	15.0	15.0
68	15.3	15.3	15.3
72	15.5	15.5	15.5
76	15.8	15.8	15.8
80	16.0	16.1	16.1
84	16.3	16.3	16.3
88	16.5	16.5	16.5
90			

Subtract from table, back cover

New Moon 8

GMT	♈ GHA	VENUS −3.5 GHA	VENUS −3.5 Dec.	MARS −0.5 GHA	MARS −0.5 Dec.	JUPITER −1.5 GHA	JUPITER −1.5 Dec.	SATURN 0.4 GHA	SATURN 0.4 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
11 0	259 18.5	161 42.9	+23 43.7	282 06.1	−12 50.4	111 03.4	+13 55.8	23 03.9	−17 34.3	148 38.7	48	+18 33.1	− 79
1	274 20.9	176 46.5	43.2	297 07.2	50.1	126 05.6	55.7	38 06.5	34.2	163 02.5	49	18 25.2	− 80
2	289 23.4	191 50.1	42.7	312 08.4	49.7	141 07.7	55.6	53 09.1	34.2	177 26.4	50	18 17.2	− 81
3	304 25.9	206 53.7	·· 42.2	327 09.6	·· 49.3	156 09.8	·· 55.5	68 11.8	·· 34.2	191 50.4	51	·18 09.1	− 82
4	319 28.3	221 57.3	41.7	342 10.7	48.9	171 11.9	55.3	83 14.4	34.1	206 14.5	51	18 00.9	− 84
5	334 30.8	237 00.9	41.2	357 11.9	48.5	186 14.1	55.2	98 17.0	34.1	220 38.6	52	17 52.5	− 85
6	349 33.2	252 04.5	+23 40.7	12 13.1	−12 48.1	201 16.2	+13 55.1	113 19.7	−17 34.1	235 02.8	54	+17 44.0	− 86
7	4 35.7	267 08.1	40.2	27 14.2	47.7	216 18.3	55.0	128 22.3	34.0	249 27.2	53	17 35.4	− 88
8	19 38.2	282 11.7	39.8	42 15.4	47.4	231 20.4	54.9	143 24.9	34.0	263 51.5	55	17 26.6	− 88
9	34 40.6	297 15.4	·· 39.3	57 16.6	·· 47.0	246 22.6	·· 54.7	158 27.6	·· 34.0	278 16.0	56	·17 17.8	− 90
10	49 43.1	312 19.0	38.8	72 17.7	46.6	261 24.7	54.6	173 30.2	33.9	292 40.6	56	17 08.8	− 91
11	64 45.6	327 22.6	38.3	87 18.9	46.2	276 26.8	54.5	188 32.8	33.9	307 05.2	57	16 59.7	− 91
12	79 48.0	342 26.2	+23 37.8	102 20.0	−12 45.8	291 28.9	+13 54.4	203 35.5	−17 33.9	321 29.9	58	+16 50.6	− 93
13	94 50.5	357 29.9	37.3	117 21.2	45.4	306 31.0	54.2	218 38.1	33.9	335 54.7	59	16 41.3	− 94
14	109 53.0	12 33.5	36.8	132 22.4	45.1	321 33.2	54.1	233 40.7	33.8	350 19.6	59	16 31.9	− 95
15	124 55.4	27 37.1	·· 36.3	147 23.5	·· 44.7	336 35.3	·· 54.0	248 43.4	·· 33.8	4 44.5	61	·16 22.4	− 97
16	139 57.9	42 40.8	35.8	162 24.7	44.3	351 37.4	53.9	263 46.0	33.8	19 09.6	61	16 12.7	− 97
17	155 00.4	57 44.4	35.3	177 25.9	43.9	6 39.5	53.7	278 48.6	33.7	33 34.7	62	16 03.0	− 98
18	170 02.8	72 48.1	+23 34.8	192 27.1	−12 43.5	21 41.7	+13 53.6	293 51.3	−17 33.7	47 59.9	64	+15 53.2	− 99
19	185 05.3	87 51.7	34.3	207 28.2	43.1	36 43.8	53.5	308 53.9	33.7	62 25.3	63	15 43.3	−100
20	200 07.7	102 55.4	33.8	222 29.4	42.8	51 45.9	53.4	323 56.5	33.6	76 50.6	65	15 33.3	−101
21	215 10.2	117 59.0	·· 33.3	237 30.6	·· 42.4	66 48.0	·· 53.2	338 59.2	·· 33.6	91 16.1	66	·15 23.2	−102
22	230 12.7	133 02.7	32.8	252 31.7	42.0	81 50.1	53.1	354 01.8	33.6	105 41.7	66	15 13.0	−103
23	245 15.1	148 06.4	32.3	267 32.9	41.6	96 52.3	53.0	9 04.4	33.5	120 07.3	68	15 02.7	−104
12 0	260 17.6	163 10.0	+23 31.8	282 34.1	−12 41.2	111 54.4	+13 52.9	24 07.1	−17 33.5	134 33.1	68	+14 52.3	−105
1	275 20.1	178 13.7	31.3	297 35.2	40.8	126 56.5	52.7	39 09.7	33.5	148 58.9	69	14 41.8	−106
2	290 22.5	193 17.4	30.8	312 36.4	40.5	141 58.6	52.6	54 12.3	33.5	163 24.8	70	14 31.2	−106
3	305 25.0	208 21.1	·· 30.3	327 37.6	·· 40.1	157 00.7	·· 52.5	69 15.0	·· 33.4	177 50.8	71	·14 20.6	−108
4	320 27.5	223 24.8	29.8	342 38.8	39.7	172 02.9	52.4	84 17.6	33.4	192 16.9	71	14 09.8	−108
5	335 29.9	238 28.5	29.3	357 39.9	39.3	187 05.0	52.2	99 20.2	33.4	206 43.0	73	13 59.0	−109
6	350 32.4	253 32.2	+23 28.8	12 41.1	−12 38.9	202 07.1	+13 52.1	114 22.9	−17 33.3	221 09.3	73	+13 48.1	−110
7	5 34.9	268 35.9	28.3	27 42.3	38.5	217 09.2	52.0	129 25.5	33.3	235 35.6	74	13 37.1	−110
8	20 37.3	283 39.6	27.8	42 43.5	38.2	232 11.3	51.9	144 28.1	33.3	250 02.0	75	13 26.1	−112
9	35 39.8	298 43.3	·· 27.3	57 44.6	·· 37.8	247 13.4	·· 51.7	159 30.8	·· 33.2	264 28.5	76	·13 14.9	−112
10	50 42.2	313 47.0	26.8	72 45.8	37.4	262 15.6	51.6	174 33.4	33.2	278 55.1	77	13 03.7	−112
11	65 44.7	328 50.7	26.3	87 47.0	37.0	277 17.7	51.5	189 36.0	33.2	293 21.8	78	12 52.5	−114
12	80 47.2	343 54.4	+23 25.8	102 48.2	−12 36.6	292 19.8	+13 51.4	204 38.7	−17 33.2	307 48.6	78	+12 41.1	−114
13	95 49.6	358 58.1	25.3	117 49.3	36.2	307 21.9	51.2	219 41.3	33.1	322 15.4	79	12 29.7	−115
14	110 52.1	14 01.9	24.8	132 50.5	35.9	322 24.0	51.1	234 43.9	33.1	336 42.3	80	12 18.2	−116
15	125 54.6	29 05.6	·· 24.3	147 51.7	·· 35.5	337 26.2	·· 51.0	249 46.6	·· 33.1	351 09.3	81	·12 06.6	−116
16	140 57.0	44 09.3	23.8	162 52.9	35.1	352 28.3	50.9	264 49.2	33.0	5 36.4	82	11 55.0	−117
17	155 59.5	59 13.1	23.3	177 54.1	34.7	7 30.4	50.7	279 51.8	33.0	20 03.6	83	11 43.3	−117
18	171 02.0	74 16.8	+23 22.8	192 55.2	−12 34.3	22 32.5	+13 50.6	294 54.4	−17 33.0	34 30.9	83	+11 31.6	−118
19	186 04.4	89 20.5	22.3	207 56.4	34.0	37 34.6	50.5	309 57.1	32.9	48 58.2	84	11 19.8	−119
20	201 06.9	104 24.3	21.8	222 57.6	33.6	52 36.7	50.4	324 59.7	32.9	63 25.6	85	11 07.9	−119
21	216 09.4	119 28.0	·· 21.2	237 58.8	·· 33.2	67 38.9	·· 50.2	340 02.3	·· 32.9	77 53.1	86	·10 56.0	−119
22	231 11.8	134 31.8	20.7	253 00.0	32.8	82 41.0	50.1	355 05.0	32.9	92 20.7	87	10 44.1	−121
23	246 14.3	149 35.5	20.2	268 01.1	32.4	97 43.1	50.0	10 07.6	32.8	106 48.4	87	10 32.0	−120
13 0	261 16.7	164 39.3	+23 19.7	283 02.3	−12 32.1	112 45.2	+13 49.9	25 10.2	−17 32.8	121 16.1	89	+10 20.0	−122
1	276 19.2	179 43.1	19.2	298 03.5	31.7	127 47.3	49.7	40 12.9	32.8	135 44.0	88	10 07.8	−121
2	291 21.7	194 46.8	18.7	313 04.7	31.3	142 49.4	49.6	55 15.5	32.7	150 11.8	90	9 55.7	−123
3	306 24.1	209 50.6	·· 18.2	328 05.9	·· 30.9	157 51.5	·· 49.5	70 18.1	·· 32.7	164 39.8	91	· 9 43.4	−122
4	321 26.6	224 54.4	17.7	343 07.1	30.5	172 53.7	49.4	85 20.7	32.7	179 07.9	91	9 31.2	−123
5	336 29.1	239 58.1	17.2	358 08.2	30.2	187 55.8	49.2	100 23.4	32.6	193 36.0	92	9 18.9	−124
6	351 31.5	255 01.9	+23 16.6	13 09.4	−12 29.8	202 57.9	+13 49.1	115 26.0	−17 32.6	208 04.2	93	+ 9 06.5	−124
7	6 34.0	270 05.7	16.1	28 10.6	29.4	218 00.0	49.0	130 28.6	32.6	222 32.5	93	8 54.1	−124
8	21 36.5	285 09.5	15.6	43 11.8	29.0	233 02.1	48.9	145 31.3	32.6	237 00.8	94	8 41.7	−125
9	36 38.9	300 13.3	·· 15.1	58 13.0	·· 28.6	248 04.2	·· 48.7	160 33.9	·· 32.5	251 29.2	95	· 8 29.2	−125
10	51 41.4	315 17.1	14.6	73 14.2	28.3	263 06.3	48.6	175 36.5	32.5	265 57.7	96	8 16.7	−125
11	66 43.8	330 20.9	14.1	88 15.4	27.9	278 08.5	48.5	190 39.2	32.5	280 26.3	96	8 04.2	−126
12	81 46.3	345 24.7	+23 13.6	103 16.5	−12 27.5	293 10.6	+13 48.3	205 41.8	−17 32.4	294 54.9	97	+ 7 51.6	−126
13	96 48.8	0 28.5	13.0	118 17.7	27.1	308 12.7	48.2	220 44.4	32.4	309 23.6	98	7 39.0	−126
14	111 51.2	15 32.3	12.5	133 18.9	26.7	323 14.8	48.1	235 47.0	32.4	323 52.4	99	7 26.4	−127
15	126 53.7	30 36.1	·· 12.0	148 20.1	·· 26.4	338 16.9	·· 48.0	250 49.7	·· 32.4	338 21.3	99	· 7 13.7	−127
16	141 56.2	45 39.9	11.5	163 21.3	26.0	353 19.0	47.8	265 52.3	32.3	352 50.2	99	7 01.0	−127
17	156 58.6	60 43.7	11.0	178 22.5	25.6	8 21.1	47.7	280 54.9	32.3	7 19.1	101	6 48.3	−127
18	172 01.1	75 47.5	+23 10.5	193 23.7	−12 25.2	23 23.3	+13 47.6	295 57.6	−17 32.3	21 48.2	101	+ 6 35.6	−128
19	187 03.6	90 51.4	09.9	208 24.9	24.8	38 25.4	47.5	311 00.2	32.2	36 17.3	102	6 22.8	−128
20	202 06.0	105 55.2	09.4	223 26.1	24.5	53 27.5	47.3	326 02.8	32.2	50 46.5	102	6 10.0	−128
21	217 08.5	120 59.0	·· 08.9	238 27.3	·· 24.1	68 29.6	·· 47.2	341 05.4	·· 32.2	65 15.7	103	· 5 57.2	−128
22	232 11.0	136 02.8	08.4	253 28.4	23.7	83 31.7	47.1	356 08.1	32.1	79 45.0	103	5 44.4	−129
23	247 13.4	151 06.7	07.9	268 29.6	23.3	98 33.8	46.9	11 10.7	32.1	94 14.3	105	5 31.5	−128
24	262 15.9	166 10.5	+23 07.3	283 30.8	−12 23.0	113 35.9	+13 46.8	26 13.3	−17 32.1	108 43.8	104	+ 5 18.7	−129
code	−	+ 37	− 5	+ 11	+ 4	+ 21	− 2	+ 26	+ 1				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
11 00	180 08.7	+23 04.2	7	Acamar	315 51.1	−40 28.5
01	195 08.5	04.4	5	Achernar	335 58.8	−57 27.1
02	210 08.4	04.5	30	Acrux	173 57.0	−62 51.9
03	225 08.3	·· 04.7	19	Adhara	255 46.5	−28 54.9
04	240 08.2	04.9	10	Aldebaran	291 38.8	+16 25.3
05	255 08.0	05.1				
06	270 07.9	+23 05.2	32	Alioth	166 57.9	+56 11.9
07	285 07.8	05.4	34	Alkaid	153 32.2	+49 31.9
08	300 07.6	05.6	55	Al Na'ir	28 37.1	−47 10.0
09	315 07.5	·· 05.8	15	Alnilam	276 30.1	− 1 13.8
10	330 07.4	05.9	25	Alphard	218 38.2	− 8 28.3
11	345 07.3	06.1				
12	0 07.1	+23 06.3	41	Alphecca	126 46.9	+26 51.7
13	15 07.0	06.4	1	Alpheratz	358 27.8	+28 50.9
14	30 06.9	06.6	51	Altair	62 49.6	+ 8 45.2
15	45 06.8	·· 06.8	2	Ankaa	353 57.9	−42 32.2
16	60 06.6	07.0	42	Antares	113 18.3	−26 20.3
17	75 06.5	07.1				
18	90 06.4	+23 07.3	37	Arcturus	146 34.5	+19 24.5
19	105 06.2	07.5	43	Atria	108 58.0	−68 57.1
20	120 06.1	07.6	22	Avior	234 36.0	−59 22.4
21	135 06.0	·· 07.8	13	Bellatrix	279 18.2	+ 6 18.6
22	150 05.9	07.9	16	Betelg'se	271 47.9	+ 7 24.0
23	165 05.7	08.1				
			17	Canopus	264 15.7	−52 40.4
12 00	180 05.6	+23 08.3	12	Capella	281 38.1	+45 57.3
01	195 05.5	08.4	53	Deneb	50 00.3	+45 07.4
02	210 05.3	08.6	28	Denebola	183 17.2	+14 48.9
03	225 05.2	·· 08.8	4	Diphda	349 38.8	−18 13.3
04	240 05.1	08.9				
05	255 05.0	09.1	27	Dubhe	194 44.1	+61 59.4
06	270 04.8	+23 09.2	14	Elnath	279 07.0	+28 34.3
07	285 04.7	09.4	47	Eltanin	91 05.5	+51 29.6
08	300 04.6	09.5	54	Enif	34 28.9	+ 9 40.5
09	315 04.4	·· 09.7	56	Fomalhaut	16 11.0	−29 50.9
10	330 04.3	09.9				
11	345 04.2	10.0	31	Gacrux	172 48.4	−56 52.5
12	0 04.1	+23 10.2	29	Gienah	176 36.2	−17 18.2
13	15 03.9	10.3	35	Hadar	149 48.2	−60 10.1
14	30 03.8	10.5	6	Hamal	328 49.3	+23 15.4
15	45 03.7	·· 10.6	48	Kaus Aust.	84 40.1	−34 24.3
16	60 03.5	10.8				
17	75 03.4	10.9	40	Kochab	137 17.1	+74 20.2
18	90 03.3	+23 11.1	57	Markab	14 20.9	+14 58.3
19	105 03.1	11.2	8	Menkar	315 00.0	+ 3 55.2
20	120 03.0	11.4	36	Menkent	148 57.8	−36 09.6
21	135 02.9	·· 11.5	24	Miapl'dus	221 49.4	−69 32.6
22	150 02.8	11.7				
23	165 02.6	11.8	9	Mirfak	309 42.0	+49 42.3
			50	Nunki	76 50.9	−26 21.0
13 00	180 02.5	+23 11.9	52	Peacock	54 26.0	−56 52.3
01	195 02.4	12.1	21	Pollux	244 20.3	+28 07.9
02	210 02.2	12.2	20	Procyon	245 44.7	+ 5 20.2
03	225 02.1	·· 12.4				
04	240 02.0	12.5	46	R'alhague	96 45.8	+12 35.5
05	255 01.8	12.7	26	Regulus	208 29.1	+12 10.8
06	270 01.7	+23 12.8	11	Rigel	281 53.5	− 8 15.1
07	285 01.6	12.9	38	Rigil Kent.	140 49.7	−60 39.7
08	300 01.5	13.1	44	Sabik	103 01.2	−15 40.3
09	315 01.3	·· 13.2				
10	330 01.2	13.4	3	Schedar	350 29.5	+56 17.7
11	345 01.1	13.5	45	Shaula	97 19.5	−37 04.4
12	0 00.9	+23 13.6	18	Sirius	259 11.7	−16 39.4
13	15 00.8	13.8	33	Spica	159 16.2	−10 56.2
14	30 00.7	13.9	23	Suhail	223 24.2	−43 15.7
15	45 00.5	·· 14.0				
16	60 00.4	14.2	49	Vega	81 07.5	+38 44.5
17	75 00.3	14.3	39	Zub'g'bi	137 52.5	−15 51.8
18	90 00.1	+23 14.4				
19	105 00.0	14.6				
20	119 59.9	14.7				
21	134 59.7	·· 14.8				
22	149 59.6	15.0				
23	164 59.5	15.1				
24	179 59.4	+23 15.2				
code	—	+ 1				

Lat.	Sunrise	Twlt. begins	Moonrise 11	12	13	14
N °	h m	h m	h m	h m	h m	h m
72	□	□	□	6 02	8 24	10 30
70	□	□	4 07	6 31	8 38	10 35
68	□	□	4 48	6 52	8 48	10 38
66	0 10	////	5 15	7 08	8 57	10 41
64	1 36	////	5 36	7 22	9 05	10 43
62	2 12	////	5 54	7 33	9 11	10 45
60	2 37	////	6 08	7 42	9 16	10 47
58	2 57	////	6 20	7 51	9 21	10 49
56	3 14	////	6 30	7 58	9 26	10 50
54	3 28	////	6 39	8 05	9 29	10 52
52	3 40	////	6 47	8 10	9 33	10 53
50	3 50	////	6 54	8 16	9 36	10 54
45	4 13	1 42	7 10	8 27	9 43	10 56
40	4 30	2 29	7 23	8 36	9 48	10 58
35	4 45	2 59	7 33	8 44	9 53	11 00
30	4 58	3 22	7 43	8 51	9 58	11 01
20	5 20	3 56	7 59	9 03	10 05	11 04
10	5 39	4 22	8 13	9 14	10 11	11 06
0	5 56	4 41	8 26	9 24	10 17	11 08
10	6 13	4 58	8 40	9 33	10 23	11 10
20	6 32	5 13	8 54	9 44	10 30	11 12
30	6 53	5 27	9 09	9 56	10 37	11 15
35	7 05	5 34	9 19	10 03	10 41	11 17
40	7 19	5 41	9 29	10 10	10 46	11 18
45	7 35	5 48	9 42	10 19	10 52	11 20
50	7 56	5 56	9 57	10 30	10 58	11 23
52	8 06	6 00	10 04	10 35	11 01	11 24
54	8 16	6 03	10 11	10 41	11 05	11 25
56	8 29	6 07	10 20	10 47	11 08	11 26
58	8 43	6 10	10 30	10 54	11 12	11 28
60	9 00	6 14	10 41	11 01	11 17	11 29
S						

Lat.	Sunset	Twlt. ends	Moonset 11	12	13	14
N °	h m	h m	h m	h m	h m	h m
72	□	□	□	0 36	10 09 / 23 50	23 33
70	□	□	0 29	10 06 / 23 53	23 42	23 33
68	□	□	23 44	23 40	23 37	23 33
66	□	□	23 26	23 30	23 32	23 33
64	22 25	////	23 12	23 21	23 27	23 33
62	21 48	////	22 59	23 13	23 24	23 33
60	21 23	////	22 49	23 07	23 21	23 33
58	21 03	////	22 39	23 01	23 18	23 33
56	20 46	////	22 31	22 56	23 15	23 32
54	20 32	////	22 24	22 51	23 13	23 32
52	20 20	////	22 18	22 47	23 11	23 32
50	20 09	////	22 12	22 43	23 09	23 32
45	19 47	22 19	21 59	22 34	23 04	23 32
40	19 29	21 32	21 49	22 27	23 01	23 32
35	19 14	21 01	21 40	22 21	22 58	23 32
30	19 02	20 38	21 32	22 15	22 55	23 32
20	18 40	20 04	21 18	22 06	22 50	23 32
10	18 21	19 38	21 06	21 58	22 46	23 32
0	18 03	19 18	20 54	21 50	22 42	23 31
10	17 46	19 01	20 42	21 42	22 38	23 31
20	17 28	18 47	20 30	21 33	22 33	23 31
30	17 07	18 32	20 16	21 23	22 28	23 31
35	16 55	18 26	20 07	21 17	22 25	23 31
40	16 41	18 18	19 57	21 11	22 22	23 30
45	16 24	18 11	19 46	21 03	22 18	23 30
50	16 04	18 03	19 32	20 54	22 13	23 30
52	15 54	18 00	19 26	20 49	22 11	23 30
54	15 43	17 56	19 19	20 45	22 09	23 30
56	15 30	17 52	19 11	20 39	22 06	23 29
58	15 16	17 48	19 02	20 34	22 03	23 29
60	14 59	17 44	18 51	20 27	22 00	23 29
S						

GMT	Equation of Time (App.—Mean) 11	12	13
h	m s	m s	m s
0	+ 0 34.9	+ 0 22.7	+ 0 10.2
6	+ 0 31.8	+ 0 19.6	+ 0 07.1
12	+ 0 28.8	+ 0 16.5	+ 0 04.0
18	+ 0 25.7	+ 0 13.4	+ 0 00.8
24	+ 0 22.7	+ 0 10.2	− 0 02.3

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
11	14 40	13 10	5 11	16 33	22 24
12	15 37	13 04	5 09	16 30	22 20
13	16 30	12 58	5 07	16 27	22 15
14	17 20	12 52	5 06	16 23	22 11

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.1	0.5	0.2
30	0.1	0.4	0.2
45	0.1	0.3	0.1
60	0.1	0.2	0.1
75	0.1	0.1	0.0
90			

Moon's Lower Limb Add

Alt.	11	12	13
°	′	′	′
0	20.3	19.6	18.9
4	20.2	19.6	18.8
8	20.2	19.6	18.8
12	20.1	19.5	18.8
16	20.1	19.5	18.7
20	20.0	19.4	18.7
24	19.9	19.3	18.6
28	19.8	19.2	18.5
32	19.6	19.1	18.4
36	19.5	18.9	18.3
40	19.3	18.8	18.2
44	19.1	18.6	18.1
48	18.9	18.5	17.9
52	18.7	18.3	17.8
56	18.5	18.1	17.6
60	18.3	17.9	17.5
64	18.1	17.7	17.3
68	17.8	17.5	17.1
72	17.6	17.3	17.0
76	17.3	17.1	16.8
80	17.1	16.9	16.6
84	16.8	16.6	16.4
88	16.6	16.5	16.3
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	11	12	13
°	′	′	′
0	12.9	13.2	13.7
4	12.9	13.2	13.7
8	12.9	13.3	13.7
12	13.0	13.3	13.7
16	13.0	13.4	13.8
20	13.1	13.5	13.8
24	13.2	13.5	13.9
28	13.4	13.6	14.0
32	13.5	13.8	14.1
36	13.6	13.9	14.2
40	13.8	14.0	14.3
44	14.0	14.2	14.5
48	14.2	14.4	14.6
52	14.4	14.5	14.7
56	14.6	14.7	14.9
60	14.8	14.9	15.0
64	15.1	15.1	15.2
68	15.3	15.3	15.4
72	15.5	15.5	15.5
76	15.8	15.8	15.7
80	16.0	16.0	15.9
84	16.3	16.2	16.1
88	16.5	16.4	16.2
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.3 GHA	VENUS −3.3 Dec.	MARS −0.6 GHA	MARS −0.6 Dec.	JUPITER −1.5 GHA	JUPITER −1.5 Dec.	SATURN 0.4 GHA	SATURN 0.4 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
14 0	262 15.9	166 10.5	+23 07.3	283 30.8	−12 23.0	113 35.9	+13 46.8	26 13.3	−17 32.1	108 43.8	104	+ 5 18.7	−129
1	277 18.3	181 14.4	06.8	298 32.0	22.6	128 38.0	46.7	41 16.0	32.1	123 13.2	106	5 05.8	−129
2	292 20.8	196 18.2	06.3	313 33.2	22.2	143 40.1	46.6	56 18.6	32.0	137 42.8	105	4 52.9	−129
3	307 23.3	211 22.1	05.8	328 34.4	21.8	158 42.3	46.4	71 21.2	32.0	152 12.3	107	4 40.0	−129
4	322 25.7	226 25.9	05.3	343 35.6	21.4	173 44.4	46.3	86 23.8	32.0	166 42.0	107	4 27.1	−129
5	337 28.2	241 29.8	04.7	358 36.8	21.1	188 46.5	46.2	101 26.5	31.9	181 11.7	107	4 14.2	−129
6	352 30.7	256 33.6	+23 04.2	13 38.0	−12 20.7	203 48.6	+13 46.0	116 29.1	−17 31.9	195 41.4	109	+ 4 01.3	−130
7	7 33.1	271 37.5	03.7	28 39.2	20.3	218 50.7	45.9	131 31.7	31.9	210 11.3	108	3 48.3	−129
8	22 35.6	286 41.3	03.2	43 40.4	19.9	233 52.8	45.8	146 34.4	31.9	224 41.1	109	3 35.4	−130
9	37 38.1	301 45.2	02.6	58 41.6	19.6	248 54.9	45.7	161 37.0	31.8	239 11.0	110	3 22.4	−129
10	52 40.5	316 49.1	02.1	73 42.8	19.2	263 57.0	45.5	176 39.6	31.8	253 41.0	110	3 09.5	−130
11	67 43.0	331 53.0	01.6	88 44.0	18.8	278 59.1	45.4	191 42.2	31.8	268 11.0	111	2 56.5	−129
12	82 45.5	346 56.8	+23 01.1	103 45.2	−12 18.4	294 01.2	+13 45.3	206 44.9	−17 31.7	282 41.1	111	+ 2 43.6	−130
13	97 47.9	2 00.7	00.5	118 46.4	18.1	309 03.4	45.1	221 47.5	31.7	297 11.2	111	2 30.6	−130
14	112 50.4	17 04.6	23 00.0	133 47.6	17.7	324 05.5	45.0	236 50.1	31.7	311 41.3	112	2 17.6	−129
15	127 52.8	32 08.5	22 59.5	148 48.8	17.3	339 07.6	44.9	251 52.7	31.7	326 11.5	113	2 04.7	−130
16	142 55.3	47 12.4	58.9	163 50.0	16.9	354 09.7	44.8	266 55.4	31.6	340 41.8	113	1 51.7	−129
17	157 57.8	62 16.3	58.4	178 51.2	16.5	9 11.8	44.6	281 58.0	31.6	355 12.1	113	1 38.8	−129
18	173 00.2	77 20.1	+22 57.9	193 52.4	−12 16.2	24 13.9	+13 44.5	297 00.6	−17 31.6	9 42.4	114	+ 1 25.9	−130
19	188 02.7	92 24.0	57.4	208 53.6	15.8	39 16.0	44.4	312 03.3	31.5	24 12.8	114	1 12.9	−129
20	203 05.2	107 27.9	56.8	223 54.8	15.4	54 18.1	44.2	327 05.9	31.5	38 43.2	115	1 00.0	−129
21	218 07.6	122 31.8	56.3	238 56.0	15.0	69 20.2	44.1	342 08.5	31.5	53 13.7	115	0 47.1	−129
22	233 10.1	137 35.7	55.8	253 57.2	14.7	84 22.3	44.0	357 11.1	31.5	67 44.2	115	0 34.2	−129
23	248 12.6	152 39.6	55.2	268 58.4	14.3	99 24.4	43.9	12 13.8	31.4	82 14.7	116	0 21.3	−129
15 0	263 15.0	167 43.6	+22 54.7	283 59.6	−12 13.9	114 26.5	+13 43.7	27 16.4	−17 31.4	96 45.3	116	+ 0 08.4	−128
1	278 17.5	182 47.5	54.2	299 00.8	13.5	129 28.6	43.6	42 19.0	31.4	111 15.9	116	− 0 04.4	−129
2	293 20.0	197 51.4	53.7	314 02.0	13.2	144 30.8	43.5	57 21.6	31.3	125 46.5	117	0 17.3	−128
3	308 22.4	212 55.3	53.1	329 03.2	12.8	159 32.9	43.3	72 24.3	31.3	140 17.2	117	0 30.1	−129
4	323 24.9	227 59.2	52.6	344 04.4	12.4	174 35.0	43.2	87 26.9	31.3	154 47.9	118	0 43.0	−128
5	338 27.3	243 03.2	52.1	359 05.6	12.0	189 37.1	43.1	102 29.5	31.3	169 18.7	118	0 55.8	−127
6	353 29.8	258 07.1	+22 51.5	14 06.8	−12 11.7	204 39.2	+13 42.9	117 32.1	−17 31.2	183 49.5	118	− 1 08.5	−128
7	8 32.3	273 11.0	51.0	29 08.0	11.3	219 41.3	42.8	132 34.8	31.2	198 20.3	118	1 21.3	−127
8	23 34.7	288 15.0	50.5	44 09.3	10.9	234 43.4	42.7	147 37.4	31.2	212 51.1	119	1 34.0	−128
9	38 37.2	303 18.9	49.9	59 10.5	10.6	249 45.5	42.6	162 40.0	31.1	227 22.0	119	1 46.8	−126
10	53 39.7	318 22.8	49.4	74 11.7	10.2	264 47.6	42.4	177 42.6	31.1	241 52.9	119	1 59.4	−127
11	68 42.1	333 26.8	48.9	89 12.9	09.8	279 49.7	42.3	192 45.3	31.1	256 23.8	119	2 12.1	−127
12	83 44.6	348 30.7	+22 48.3	104 14.1	−12 09.4	294 51.8	+13 42.2	207 47.9	−17 31.1	270 54.7	120	− 2 24.8	−126
13	98 47.1	3 34.7	47.8	119 15.3	09.1	309 53.9	42.0	222 50.5	31.0	285 25.7	120	2 37.4	−126
14	113 49.5	18 38.6	47.2	134 16.5	08.7	324 56.0	41.9	237 53.1	31.0	299 56.7	120	2 50.0	−125
15	128 52.0	33 42.6	46.7	149 17.7	08.3	339 58.1	41.8	252 55.8	31.0	314 27.7	120	3 02.5	−126
16	143 54.4	48 46.5	46.2	164 18.9	07.9	355 00.2	41.6	267 58.4	30.9	328 58.7	121	3 15.1	−125
17	158 56.9	63 50.5	45.6	179 20.1	07.6	10 02.3	41.5	283 01.0	30.9	343 29.8	121	3 27.6	−125
18	173 59.4	78 54.4	+22 45.1	194 21.4	−12 07.2	25 04.4	+13 41.4	298 03.6	−17 30.9	358 00.9	121	− 3 40.1	−124
19	189 01.8	93 58.4	44.6	209 22.6	06.8	40 06.5	41.3	313 06.3	30.9	12 32.0	121	3 52.5	−124
20	204 04.3	109 02.4	44.0	224 23.8	06.4	55 08.6	41.1	328 08.9	30.8	27 03.1	121	4 04.9	−124
21	219 06.8	124 06.3	43.5	239 25.0	06.1	70 10.8	41.0	343 11.5	30.8	41 34.2	122	4 17.3	−123
22	234 09.2	139 10.3	42.9	254 26.2	05.7	85 12.9	40.9	358 14.1	30.8	56 05.4	122	4 29.6	−123
23	249 11.7	154 14.3	42.4	269 27.4	05.3	100 15.0	40.7	13 16.8	30.7	70 36.6	122	4 41.9	−123
16 0	264 14.2	169 18.2	+22 41.9	284 28.6	−12 05.0	115 17.1	+13 40.6	28 19.4	−17 30.7	85 07.8	122	− 4 54.2	−122
1	279 16.6	184 22.2	41.3	299 29.9	04.6	130 19.2	40.5	43 22.0	30.7	99 39.0	122	5 06.4	−122
2	294 19.1	199 26.2	40.8	314 31.1	04.2	145 21.3	40.3	58 24.6	30.7	114 10.2	122	5 18.6	−122
3	309 21.6	214 30.2	40.2	329 32.3	03.8	160 23.4	40.2	73 27.3	30.6	128 41.4	122	5 30.8	−121
4	324 24.0	229 34.2	39.7	344 33.5	03.5	175 25.5	40.1	88 29.9	30.6	143 12.6	123	5 42.9	−121
5	339 26.5	244 38.2	39.2	359 34.7	03.1	190 27.6	39.9	103 32.5	30.6	157 43.9	122	5 55.0	−120
6	354 28.9	259 42.2	+22 38.6	14 35.9	−12 02.7	205 29.7	+13 39.8	118 35.1	−17 30.6	172 15.1	123	− 6 07.0	−120
7	9 31.4	274 46.1	38.1	29 37.2	02.4	220 31.8	39.7	133 37.7	30.5	186 46.4	123	6 19.0	−120
8	24 33.9	289 50.1	37.5	44 38.4	02.0	235 33.9	39.5	148 40.4	30.5	201 17.7	123	6 31.0	−119
9	39 36.3	304 54.1	37.0	59 39.6	01.6	250 36.0	39.4	163 43.0	30.5	215 49.0	122	6 42.9	−118
10	54 38.8	319 58.1	36.5	74 40.8	01.2	265 38.1	39.3	178 45.6	30.4	230 20.2	123	6 54.7	−118
11	69 41.3	335 02.1	35.9	89 42.0	00.9	280 40.2	39.2	193 48.2	30.4	244 51.5	123	7 06.5	−118
12	84 43.7	350 06.1	+22 35.4	104 43.3	−12 00.5	295 42.3	+13 39.0	208 50.9	−17 30.4	259 22.8	124	− 7 18.3	−117
13	99 46.2	5 10.1	34.8	119 44.5	12 00.1	310 44.4	38.9	223 53.5	30.4	273 54.2	123	7 30.0	−117
14	114 48.7	20 14.2	34.3	134 45.7	11 59.8	325 46.5	38.8	238 56.1	30.3	288 25.5	123	7 41.7	−116
15	129 51.1	35 18.2	33.7	149 46.9	59.4	340 48.6	38.6	253 58.7	30.3	302 56.8	123	7 53.3	−116
16	144 53.6	50 22.2	33.2	164 48.2	59.0	355 50.7	38.5	269 01.3	30.3	317 28.1	123	8 04.9	−115
17	159 56.1	65 26.2	32.6	179 49.4	58.7	10 52.8	38.4	284 04.0	30.2	331 59.4	123	8 16.4	−115
18	174 58.5	80 30.2	+22 32.1	194 50.6	−11 58.3	25 54.9	+13 38.2	299 06.6	−17 30.2	346 30.7	123	− 8 27.9	−114
19	190 01.0	95 34.2	31.6	209 51.8	57.9	40 57.0	38.1	314 09.2	30.2	1 02.0	124	8 39.3	−113
20	205 03.4	110 38.2	31.0	224 53.1	57.6	55 59.1	38.0	329 11.8	30.2	15 33.4	123	8 50.6	−113
21	220 05.9	125 42.3	30.5	239 54.3	57.2	71 01.2	37.8	344 14.5	30.1	30 04.7	123	9 01.9	−113
22	235 08.4	140 46.3	29.9	254 55.5	56.8	86 03.3	37.7	359 17.1	30.1	44 36.0	123	9 13.2	−112
23	250 10.8	155 50.3	29.4	269 56.7	56.4	101 05.4	37.6	14 19.7	30.1	59 07.3	123	9 24.4	−111
24	265 13.3	170 54.3	+22 28.8	284 58.0	−11 56.1	116 07.5	+13 37.4	29 22.3	−17 30.1	73 38.6	123	− 9 35.5	−111
code	−	+ 40	− 5	+ 12	+ 3	+ 21	− 2	+ 26	+ 1				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
14 0	179 59.4	+23 15.2	7	Acamar	315 51.1	−40 28.5
1	194 59.2	15.3	5	Achernar	335 58.8	−57 27.1
2	209 59.1	15.5	30	Acrux	173 57.0	−62 51.9
3	224 59.0	·· 15.6	19	Adhara	255 46.5	−28 54.9
4	239 58.8	15.7	10	Aldebaran	291 38.8	+16 25.3
5	254 58.7	15.8				
6	269 58.6	+23 16.0	32	Alioth	166 57.9	+56 11.9
7	284 58.4	16.1	34	Alkaid	153 32.2	+49 32.0
8	299 58.3	16.2	55	Al Na'ir	28 37.1	−47 10.0
9	314 58.2	·· 16.3	15	Alnilam	276 30.1	− 1 13.8
10	329 58.0	16.5	25	Alphard	218 38.2	− 8 28.3
11	344 57.9	16.6				
12	359 57.8	+23 16.7	41	Alphecca	126 46.9	+26 51.7
13	14 57.6	16.8	1	Alpheratz	358 27.8	+28 50.9
14	29 57.5	16.9	51	Altair	62 49.6	+ 8 45.2
15	44 57.4	·· 17.1	2	Ankaa	353 57.9	−42 32.2
16	59 57.2	17.2	42	Antares	113 18.3	−26 20.3
17	74 57.1	17.3				
18	89 57.0	+23 17.4	37	Arcturus	146 34.5	+19 24.5
19	104 56.8	17.5	43	Atria	108 58.0	−68 57.1
20	119 56.7	17.6	22	Avior	234 36.0	−59 22.4
21	134 56.6	·· 17.7	13	Bellatrix	279 18.2	+ 6 18.6
22	149 56.4	17.9	16	Betelg'se	271 47.9	+ 7 24.0
23	164 56.3	18.0				
			17	Canopus	264 15.7	−52 40.4
15 0	179 56.2	+23 18.1	12	Capella	281 38.1	+45 57.3
1	194 56.1	18.2	53	Deneb	50 00.3	+45 07.4
2	209 55.9	18.3	28	Denebola	183 17.2	+14 48.9
3	224 55.8	·· 18.4	4	Diphda	349 38.8	−18 13.3
4	239 55.7	18.5				
5	254 55.5	18.6	27	Dubhe	194 44.1	+61 59.4
6	269 55.4	+23 18.7	14	Elnath	279 07.0	+28 34.3
7	284 55.3	18.8	47	Eltanin	91 05.4	+51 29.6
8	299 55.1	18.9	54	Enif	34 28.9	+ 9 40.5
9	314 55.0	·· 19.0	56	Fomalhaut	16 11.0	−29 50.9
10	329 54.9	19.1				
11	344 54.7	19.3	31	Gacrux	172 48.5	−56 52.6
12	359 54.6	+23 19.4	29	Gienah	176 36.2	−17 18.2
13	14 54.5	19.5	35	Hadar	149 48.2	−60 10.1
14	29 54.3	19.6	6	Hamal	328 49.2	+23 15.4
15	44 54.2	·· 19.7	48	Kaus Aust.	84 40.1	−34 24.3
16	59 54.1	19.8				
17	74 53.9	19.9	40	Kochab	137 17.1	+74 20.2
18	89 53.8	+23 20.0	57	Markab	14 20.8	+14 58.3
19	104 53.7	20.1	8	Menkar	315 00.0	+ 3 55.2
20	119 53.5	20.1	36	Menkent	148 57.8	−36 09.6
21	134 53.4	·· 20.2	24	Miapl'dus	221 49.4	−69 32.6
22	149 53.3	20.3				
23	164 53.1	20.4	9	Mirfak	309 42.0	+49 42.3
			50	Nunki	76 50.9	−26 21.0
16 0	179 53.0	+23 20.5	52	Peacock	54 26.0	−56 52.3
1	194 52.9	20.6	21	Pollux	244 20.3	+28 07.9
2	209 52.7	20.7	20	Procyon	245 44.7	+ 5 20.2
3	224 52.6	·· 20.8				
4	239 52.5	20.9	46	R'alhague	96 45.8	+12 35.5
5	254 52.3	21.0	26	Regulus	208 29.1	+12 10.8
6	269 52.2	+23 21.1	11	Rigel	281 53.5	− 8 15.1
7	284 52.0	21.2	38	Rigil Kent.	140 49.7	−60 39.7
8	299 51.9	21.3	44	Sabik	103 01.2	−15 40.3
9	314 51.8	·· 21.3				
10	329 51.6	21.4	3	Schedar	350 29.5	+56 17.7
11	344 51.5	21.5	45	Shaula	97 19.5	−37 04.4
12	359 51.4	+23 21.6	18	Sirius	259 11.7	−16 39.4
13	14 51.2	21.7	33	Spica	159 16.2	−10 56.2
14	29 51.1	21.8	23	Suhail	223 24.2	−43 15.7
15	44 51.0	·· 21.8				
16	59 50.8	21.9	49	Vega	81 07.5	+38 44.6
17	74 50.7	22.0	39	Zub'g'bi	137 52.5	−15 51.8
18	89 50.6	+23 22.1				
19	104 50.4	22.2				
20	119 50.3	22.3				
21	134 50.2	·· 22.3				
22	149 50.0	22.4				
23	164 49.9	22.5				
24	179 49.8	+23 22.6				
code	—	+ 1				

Lat.	Sunrise	Twlt. begins
N °	h m	h m
72	□	□
70	□	□
68	□	□
66	□	□
64	1 33	////
62	2 10	////
60	2 36	////
58	2 56	////
56	3 13	////
54	3 27	////
52	3 39	////
50	3 50	////
45	4 13	1 41
40	4 30	2 27
35	4 45	2 58
30	4 58	3 22
20	5 20	3 56
10	5 39	4 21
0	5 57	4 42
10	6 14	4 59
20	6 32	5 13
30	6 54	5 28
35	7 06	5 35
40	7 20	5 42
45	7 37	5 49
50	7 57	5 58
52	8 07	6 01
54	8 18	6 05
56	8 31	6 08
58	8 45	6 12
60	9 03	6 17
S		

Moonrise	14	15	16	17
	h m	h m	h m	h m
	10 30	12 30	14 29	16 32
	10 35	12 27	14 16	16 07
	10 38	12 23	14 06	15 49
	10 41	12 21	13 58	15 35
	10 43	12 19	13 51	15 23
	10 45	12 17	13 46	15 13
	10 47	12 15	13 40	15 04
	10 49	12 14	13 36	14 56
	10 50	12 12	13 32	14 50
	10 52	12 11	13 29	14 44
	10 53	12 10	13 25	14 39
	10 54	12 09	13 22	14 34
	10 56	12 07	13 16	14 24
	10 58	12 05	13 11	14 15
	11 00	12 04	13 07	14 08
	11 01	12 03	13 03	14 01
	11 04	12 01	12 56	13 50
	11 06	11 59	12 50	13 41
	11 08	11 57	12 44	13 32
	11 10	11 55	12 39	13 23
	11 12	11 53	12 33	13 14
	11 15	11 51	12 27	13 03
	11 17	11 50	12 23	12 57
	11 18	11 49	12 19	12 50
	11 20	11 47	12 14	12 42
	11 23	11 46	12 08	12 32
	11 24	11 45	12 06	12 28
	11 25	11 44	12 03	12 23
	11 26	11 43	12 00	12 18
	11 28	11 42	11 56	12 12
	11 29	11 41	11 52	12 05

Lat.	Sunset	Twlt. ends
N °	h m	h m
72	□	□
70	□	□
68	□	□
66	□	□
64	22 29	////
62	21 51	////
60	21 25	////
58	21 05	////
56	20 48	////
54	20 34	////
52	20 22	////
50	20 11	////
45	19 48	22 21
40	19 30	21 33
35	19 15	21 02
30	19 02	20 39
20	18 40	20 04
10	18 22	19 40
0	18 04	19 19
10	17 47	19 02
20	17 28	18 47
30	17 07	18 32
35	16 55	18 26
40	16 41	18 19
45	16 24	18 11
50	16 03	18 02
52	15 53	17 59
54	15 42	17 55
56	15 30	17 52
58	15 15	17 48
60	14 58	17 44

Moonset	14	15	16	17
	h m	h m	h m	h m
	23 33	23 17	22 59	22 36
	23 33	23 24	23 14	23 01
	23 33	23 29	23 25	23 21
	23 33	23 34	23 35	23 37
	23 33	23 38	23 43	23 50
	23 33	23 41	23 50	24 01
	23 33	23 44	23 56	24 10
	23 33	23 47	24 02	0 02
	23 32	23 49	24 07	0 07
	23 32	23 51	24 11	0 11
	23 32	23 53	24 15	0 15
	23 32	23 55	24 19	0 19
	23 32	23 59	24 26	0 26
	23 32	24 02	0 02	0 33
	23 32	24 05	0 05	0 39
	23 32	24 08	0 08	0 44
	23 32	24 12	0 12	0 52
	23 32	24 16	0 16	1 00
	23 31	24 20	0 20	1 07
	23 31	24 23	0 23	1 14
	23 31	24 27	0 27	1 22
	23 31	24 32	0 32	1 31
	23 31	24 34	0 34	1 36
	23 30	24 37	0 37	1 42
	23 30	24 40	0 40	1 49
	23 30	24 44	0 44	1 57
	23 30	24 46	0 46	2 00
	23 30	24 48	0 48	2 05
	23 29	24 50	0 50	2 09
	23 29	24 53	0 53	2 14
	23 29	24 56	0 56	2 20

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.1	0.5	0.2
30	0.1	0.4	0.2
45	0.1	0.3	0.1
60	0.1	0.2	0.1
75	0.1	0.1	0.0
90			

Moon's Lower Limb Add

Alt.	14	15	16
°	′	′	′
0	17.8	16.8	15.9
4	17.8	16.8	15.9
8	17.8	16.8	15.9
12	17.8	16.8	15.9
16	17.8	16.8	15.9
20	17.7	16.8	15.9
24	17.7	16.7	15.9
28	17.6	16.7	15.9
32	17.5	16.7	15.9
36	17.5	16.6	15.9
40	17.4	16.6	15.9
44	17.3	16.5	15.8
48	17.2	16.5	15.8
52	17.1	16.4	15.8
56	17.0	16.4	15.8
60	16.9	16.3	15.8
64	16.8	16.2	15.8
68	16.7	16.2	15.7
72	16.5	16.1	15.7
76	16.4	16.0	15.7
80	16.3	16.0	15.7
84	16.2	15.9	15.7
88	16.1	15.8	15.6
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	14	15	16
°	′	′	′
0	14.2	14.8	15.3
4	14.3	14.8	15.3
8	14.3	14.8	15.3
12	14.3	14.9	15.3
16	14.3	14.9	15.3
20	14.4	14.9	15.4
24	14.4	14.9	15.4
28	14.5	15.0	15.4
32	14.5	15.0	15.4
36	14.6	15.0	15.4
40	14.7	15.1	15.4
44	14.8	15.1	15.4
48	14.9	15.2	15.4
52	15.0	15.2	15.5
56	15.1	15.3	15.5
60	15.2	15.4	15.5
64	15.3	15.4	15.5
68	15.4	15.5	15.5
72	15.5	15.5	15.5
76	15.7	15.6	15.6
80	15.8	15.7	15.6
84	15.9	15.8	15.6
88	16.0	15.8	15.6
90			

Subtract from table, back cover

GMT	Equation of Time (App.—Mean) 14	15	16
h	m s	m s	m s
0	− 0 02.3	− 0 15.0	− 0 27.8
6	− 0 05.5	− 0 18.2	− 0 31.0
12	− 0 08.6	− 0 21.4	− 0 34.2
18	− 0 11.8	− 0 24.6	− 0 37.4
24	− 0 15.0	− 0 27.8	− 0 40.7

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
14	17 20	12 52	5 06	16 23	22 11
15	18 08	12 46	5 04	16 20	22 07
16	18 56	12 39	5 02	16 17	22 03
17	19 43	12 33	5 00	16 13	21 59

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GMT	♈ GHA	VENUS −3.0 GHA	Dec.	MARS −0.7 GHA	Dec.	JUPITER −1.4 GHA	Dec.	SATURN 0.4 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
17 0	265 13.3	170 54.3	+22 28.8	284 58.0	−11 56.1	116 07.5	+13 37.4	29 22.3	−17 30.1	73 38.6	123	− 9 35.5	−111
1	280 15.8	185 58.4	28.3	299 59.2	55.7	131 09.6	37.3	44 24.9	30.0	88 09.9	123	9 46.6	−111
2	295 18.2	201 02.4	27.7	315 00.4	55.3	146 11.7	37.2	59 27.6	30.0	102 41.2	123	9 57.7	−109
3	310 20.7	216 06.5	·· 27.2	330 01.6	·· 55.0	161 13.8	·· 37.0	74 30.2	·· 30.0	117 12.5	123	·10 08.6	−109
4	325 23.2	231 10.5	26.6	345 02.9	54.6	176 15.9	36.9	89 32.8	29.9	131 43.8	123	10 19.5	−109
5	340 25.6	246 14.5	26.1	0 04.1	54.2	191 18.0	36.8	104 35.4	29.9	146 15.1	122	10 30.4	−108
6	355 28.1	261 18.6	+22 25.5	15 05.3	−11 53.9	206 20.1	+13 36.6	119 38.0	−17 29.9	160 46.3	123	−10 41.2	−107
7	10 30.5	276 22.6	25.0	30 06.6	53.5	221 22.2	36.5	134 40.7	29.9	175 17.6	123	10 51.9	−107
8	25 33.0	291 26.7	24.4	45 07.8	53.1	236 24.3	36.4	149 43.3	29.8	189 48.9	122	11 02.6	−106
9	40 35.5	306 30.7	·· 23.9	60 09.0	·· 52.8	251 26.4	·· 36.2	164 45.9	·· 29.8	204 20.1	122	·11 13.2	−105
10	55 37.9	321 34.8	23.3	75 10.3	52.4	266 28.5	36.1	179 48.5	29.8	218 51.3	123	11 23.7	−105
11	70 40.4	336 38.8	22.8	90 11.5	52.0	281 30.6	36.0	194 51.1	29.8	233 22.6	122	11 34.2	−104
12	85 42.9	351 42.9	+22 22.2	105 12.7	−11 51.7	296 32.7	+13 35.8	209 53.8	−17 29.7	247 53.8	122	−11 44.6	−103
13	100 45.3	6 46.9	21.7	120 14.0	51.3	311 34.8	35.7	224 56.4	29.7	262 25.0	122	11 54.9	−103
14	115 47.8	21 51.0	21.1	135 15.2	50.9	326 36.9	35.6	239 59.0	29.7	276 56.2	122	12 05.2	−102
15	130 50.3	36 55.1	·· 20.6	150 16.4	·· 50.6	341 38.9	·· 35.4	255 01.6	·· 29.6	291 27.4	122	·12 15.4	−101
16	145 52.7	51 59.1	20.0	165 17.7	50.2	356 41.0	35.3	270 04.2	29.6	305 58.6	121	12 25.5	−101
17	160 55.2	67 03.2	19.5	180 18.9	49.8	11 43.1	35.2	285 06.9	29.6	320 29.7	122	12 35.6	−100
18	175 57.7	82 07.2	+22 18.9	195 20.1	−11 49.5	26 45.2	+13 35.0	300 09.5	−17 29.6	335 00.9	121	−12 45.6	− 99
19	191 00.1	97 11.3	18.4	210 21.4	49.1	41 47.3	34.9	315 12.1	29.5	349 32.0	121	12 55.5	− 99
20	206 02.6	112 15.4	17.8	225 22.6	48.7	56 49.4	34.8	330 14.7	29.5	4 03.1	121	13 05.4	− 98
21	221 05.0	127 19.4	·· 17.3	240 23.8	·· 48.4	71 51.5	·· 34.6	345 17.3	·· 29.5	18 34.2	121	·13 15.2	− 97
22	236 07.5	142 23.5	16.7	255 25.1	48.0	86 53.6	34.5	0 20.0	29.5	33 05.3	121	13 24.9	− 97
23	251 10.0	157 27.6	16.2	270 26.3	47.6	101 55.7	34.4	15 22.6	29.4	47 36.4	120	13 34.6	− 95
18 0	266 12.4	172 31.7	+22 15.6	285 27.6	−11 47.3	116 57.8	+13 34.2	30 25.2	−17 29.4	62 07.4	121	−13 44.1	− 95
1	281 14.9	187 35.7	15.1	300 28.8	46.9	131 59.9	34.1	45 27.8	29.4	76 38.5	120	13 53.6	− 94
2	296 17.4	202 39.8	14.5	315 30.0	46.5	147 02.0	34.0	60 30.4	29.4	91 09.5	120	14 03.0	− 94
3	311 19.8	217 43.9	·· 13.9	330 31.3	·· 46.2	162 04.1	·· 33.8	75 33.1	·· 29.3	105 40.5	120	·14 12.4	− 93
4	326 22.3	232 48.0	13.4	345 32.5	45.8	177 06.2	33.7	90 35.7	29.3	120 11.5	120	14 21.7	− 92
5	341 24.8	247 52.1	12.8	0 33.7	45.4	192 08.3	33.6	105 38.3	29.3	134 42.5	119	14 30.9	− 91
6	356 27.2	262 56.2	+22 12.3	15 35.0	−11 45.1	207 10.4	+13 33.4	120 40.9	−17 29.2	149 13.4	120	−14 40.0	− 90
7	11 29.7	278 00.3	11.7	30 36.2	44.7	222 12.5	33.3	135 43.5	29.2	163 44.4	119	14 49.0	− 90
8	26 32.2	293 04.3	11.2	45 37.5	44.4	237 14.6	33.2	150 46.1	29.2	178 15.3	119	14 58.0	− 88
9	41 34.6	308 08.4	·· 10.6	60 38.7	·· 44.0	252 16.7	·· 33.0	165 48.8	·· 29.2	192 46.2	119	·15 06.8	− 88
10	56 37.1	323 12.5	10.1	75 40.0	43.6	267 18.7	32.9	180 51.4	29.1	207 17.1	118	15 15.6	− 88
11	71 39.5	338 16.6	09.5	90 41.2	43.3	282 20.8	32.7	195 54.0	29.1	221 47.9	119	15 24.4	− 86
12	86 42.0	353 20.7	+22 08.9	105 42.5	−11 42.9	297 22.9	+13 32.6	210 56.6	−17 29.1	236 18.8	118	−15 33.0	− 86
13	101 44.5	8 24.8	08.4	120 43.7	42.5	312 25.0	32.5	225 59.2	29.1	250 49.6	118	15 41.6	− 84
14	116 46.9	23 28.9	07.8	135 44.9	42.2	327 27.1	32.3	241 01.8	29.0	265 20.4	118	15 50.0	− 84
15	131 49.4	38 33.0	·· 07.3	150 46.2	·· 41.8	342 29.2	·· 32.2	256 04.5	·· 29.0	279 51.2	118	·15 58.4	− 83
16	146 51.9	53 37.1	06.7	165 47.4	41.4	357 31.3	32.1	271 07.1	29.0	294 22.0	117	16 06.7	− 83
17	161 54.3	68 41.2	06.2	180 48.7	41.1	12 33.4	31.9	286 09.7	29.0	308 52.7	117	16 15.0	− 81
18	176 56.8	83 45.3	+22 05.6	195 49.9	−11 40.7	27 35.5	+13 31.8	301 12.3	−17 28.9	323 23.4	117	−16 23.1	− 80
19	191 59.3	98 49.4	05.0	210 51.2	40.4	42 37.6	31.7	316 14.9	28.9	337 54.1	117	16 31.1	− 80
20	207 01.7	113 53.5	04.5	225 52.4	40.0	57 39.7	31.5	331 17.5	28.9	352 24.8	117	16 39.1	− 79
21	222 04.2	128 57.6	·· 03.9	240 53.7	·· 39.6	72 41.8	·· 31.4	346 20.2	·· 28.9	6 55.5	116	·16 47.0	− 78
22	237 06.7	144 01.7	03.4	255 54.9	39.3	87 43.9	31.3	1 22.8	28.8	21 26.1	116	16 54.8	− 77
23	252 09.1	159 05.8	02.8	270 56.2	38.9	102 45.9	31.1	16 25.4	28.8	35 56.7	116	17 02.5	− 76
19 0	267 11.6	174 09.9	+22 02.3	285 57.4	−11 38.5	117 48.0	+13 31.0	31 28.0	−17 28.8	50 27.3	116	−17 10.1	− 75
1	282 14.0	189 14.1	01.7	300 58.7	38.2	132 50.1	30.8	46 30.6	28.7	64 57.9	116	17 17.6	− 75
2	297 16.5	204 18.2	01.1	315 59.9	37.8	147 52.2	30.7	61 33.2	28.7	79 28.5	115	17 25.1	− 73
3	312 19.0	219 22.3	·· 00.6	331 01.2	·· 37.5	162 54.3	·· 30.6	76 35.9	·· 28.7	93 59.0	115	·17 32.4	− 73
4	327 21.4	234 26.4	22 00.0	346 02.4	37.1	177 56.4	30.4	91 38.5	28.7	108 29.5	115	17 39.7	− 72
5	342 23.9	249 30.5	21 59.5	1 03.7	36.7	192 58.5	30.3	106 41.1	28.6	123 00.0	115	17 46.9	− 70
6	357 26.4	264 34.6	+21 58.9	16 04.9	−11 36.4	208 00.6	+13 30.2	121 43.7	−17 28.6	137 30.5	115	−17 53.9	− 70
7	12 28.8	279 38.8	58.3	31 06.2	36.0	223 02.7	30.0	136 46.3	28.6	152 01.0	114	18 00.9	− 69
8	27 31.3	294 42.9	57.8	46 07.4	35.7	238 04.8	29.9	151 48.9	28.6	166 31.4	114	18 07.8	− 68
9	42 33.8	309 47.0	·· 57.2	61 08.7	·· 35.3	253 06.9	·· 29.8	166 51.6	·· 28.5	181 01.8	114	·18 14.6	− 67
10	57 36.2	324 51.1	56.7	76 10.0	34.9	268 08.9	29.6	181 54.2	28.5	195 32.2	114	18 21.3	− 67
11	72 38.7	339 55.3	56.1	91 11.2	34.6	283 11.0	29.5	196 56.8	28.5	210 02.6	114	18 28.0	− 65
12	87 41.2	354 59.4	+21 55.5	106 12.5	−11 34.2	298 13.1	+13 29.3	211 59.4	−17 28.5	224 33.0	113	−18 34.5	− 64
13	102 43.6	10 03.5	55.0	121 13.7	33.9	313 15.2	29.2	227 02.0	28.4	239 03.3	113	18 40.9	− 63
14	117 46.1	25 07.6	54.4	136 15.0	33.5	328 17.3	29.1	242 04.6	28.4	253 33.6	113	18 47.2	− 63
15	132 48.5	40 11.8	·· 53.9	151 16.2	·· 33.1	343 19.4	·· 28.9	257 07.2	·· 28.4	268 03.9	113	·18 53.5	− 61
16	147 51.0	55 15.9	53.3	166 17.5	32.8	358 21.5	28.8	272 09.9	28.4	282 34.2	113	18 59.6	− 60
17	162 53.5	70 20.0	52.7	181 18.8	32.4	13 23.6	28.7	287 12.5	28.3	297 04.5	112	19 05.6	− 60
18	177 55.9	85 24.2	+21 52.2	196 20.0	−11 32.1	28 25.7	+13 28.5	302 15.1	−17 28.3	311 34.7	112	−19 11.6	− 58
19	192 58.4	100 28.3	51.6	211 21.3	31.7	43 27.7	28.4	317 17.7	28.3	326 04.9	112	19 17.4	− 58
20	208 00.9	115 32.4	51.1	226 22.5	31.3	58 29.8	28.3	332 20.3	28.3	340 35.1	112	19 23.2	− 56
21	223 03.3	130 36.5	·· 50.5	241 23.8	·· 31.0	73 31.9	·· 28.1	347 22.9	·· 28.2	355 05.3	112	·19 28.8	− 56
22	238 05.8	145 40.7	49.9	256 25.1	30.6	88 34.0	28.0	2 25.5	28.2	9 35.5	112	19 34.4	− 55
23	253 08.3	160 44.8	49.4	271 26.3	30.3	103 36.1	27.8	17 28.2	28.2	24 05.7	111	19 39.9	− 53
24	268 10.7	175 48.9	+21 48.8	286 27.6	−11 29.9	118 38.2	+13 27.7	32 30.8	−17 28.2	38 35.8	111	−19 45.2	− 53
code	−	+ 41	− 5	+ 12	+ 4	+ 21	− 1	+ 26	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
17 0	179 49.8	+23 22.6
1	194 49.6	22.6
2	209 49.5	22.7
3	224 49.4	22.8
4	239 49.2	22.9
5	254 49.1	22.9
6	269 49.0	+23 23.0
7	284 48.8	23.1
8	299 48.7	23.2
9	314 48.6	23.2
10	329 48.4	23.3
11	344 48.3	23.4
12	359 48.2	+23 23.4
13	14 48.0	23.5
14	29 47.9	23.6
15	44 47.8	23.6
16	59 47.6	23.7
17	74 47.5	23.8
18	89 47.4	+23 23.8
19	104 47.2	23.9
20	119 47.1	23.9
21	134 46.9	24.0
22	149 46.8	24.1
23	164 46.7	24.1
18 0	179 46.5	+23 24.2
1	194 46.4	24.2
2	209 46.3	24.3
3	224 46.1	24.4
4	239 46.0	24.4
5	254 45.9	24.5
6	269 45.7	+23 24.5
7	284 45.6	24.6
8	299 45.5	24.6
9	314 45.3	24.7
10	329 45.2	24.7
11	344 45.1	24.8
12	359 44.9	+23 24.8
13	14 44.8	24.9
14	29 44.7	24.9
15	44 44.5	25.0
16	59 44.4	25.0
17	74 44.3	25.1
18	89 44.1	+23 25.1
19	104 44.0	25.2
20	119 43.8	25.2
21	134 43.7	25.3
22	149 43.6	25.3
23	164 43.4	25.4
19 0	179 43.3	+23 25.4
1	194 43.2	25.4
2	209 43.0	25.5
3	224 42.9	25.5
4	239 42.8	25.6
5	254 42.6	25.6
6	269 42.5	+23 25.6
7	284 42.4	25.7
8	299 42.2	25.7
9	314 42.1	25.8
10	329 42.0	25.8
11	344 41.8	25.8
12	359 41.7	+23 25.9
13	14 41.6	25.9
14	29 41.4	25.9
15	44 41.3	26.0
16	59 41.1	26.0
17	74 41.0	26.0
18	89 40.9	+23 26.0
19	104 40.7	26.1
20	119 40.6	26.1
21	134 40.5	26.1
22	149 40.3	26.2
23	164 40.2	26.2
24	179 40.1	+23 26.2
code	—	+ 1

STARS No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 51.0	−40 28.5
5	Achernar	335 58.8	−57 27.1
30	Acrux	173 57.0	−62 51.9
19	Adhara	255 46.5	−28 54.8
10	Aldebaran	291 38.8	+16 25.3
32	Alioth	166 57.9	+56 11.9
34	Alkaid	153 32.2	+49 32.0
55	Al Na'ir	28 37.1	−47 10.0
15	Alnilam	276 30.1	− 1 13.7
25	Alphard	218 38.3	− 8 28.3
41	Alphecca	126 46.9	+26 51.7
1	Alpheratz	358 27.8	+28 50.9
51	Altair	62 49.6	+ 8 45.2
2	Ankaa	353 57.8	−42 32.2
42	Antares	113 18.3	−26 20.3
37	Arcturus	146 34.5	+19 24.5
43	Atria	108 58.0	−68 57.1
22	Avior	234 36.0	−59 22.4
13	Bellatrix	279 18.2	+ 6 18.6
16	Betelg'se	271 47.9	+ 7 24.0
17	Canopus	264 15.7	−52 40.4
12	Capella	281 38.1	+45 57.3
53	Deneb	50 00.2	+45 07.4
28	Denebola	183 17.2	+14 48.9
4	Diphda	349 38.8	−18 13.3
27	Dubhe	194 44.1	+61 59.4
14	Elnath	279 07.0	+28 34.3
47	Eltanin	91 05.4	+51 29.7
54	Enif	34 28.9	+ 9 40.5
56	Fomalhaut	16 10.9	−29 50.9
31	Gacrux	172 48.5	−56 52.6
29	Gienah	176 36.3	−17 18.2
35	Hadar	149 48.2	−60 10.1
6	Hamal	328 49.2	+23 15.4
48	Kaus Aust.	84 40.0	−34 24.3
40	Kochab	137 17.2	+74 20.2
57	Markab	14 20.8	+14 58.3
8	Menkar	315 00.0	+ 3 55.2
36	Menkent	148 57.8	−36 09.6
24	Miapl'dus	221 49.5	−69 32.6
9	Mirfak	309 42.0	+49 42.3
50	Nunki	76 50.9	−26 21.0
52	Peacock	54 26.0	−56 52.3
21	Pollux	244 20.3	+28 07.9
20	Procyon	245 44.7	+ 5 20.2
46	R'alhague	96 45.8	+12 35.5
26	Regulus	208 29.1	+12 10.8
11	Rigel	281 53.5	− 8 15.1
38	Rigil Kent.	140 49.7	−60 39.7
44	Sabik	103 01.2	−15 40.3
3	Schedar	350 29.4	+56 17.7
45	Shaula	97 19.5	−37 04.4
18	Sirius	259 11.7	−16 39.4
33	Spica	159 16.2	−10 56.2
23	Suhail	223 24.2	−43 15.7
49	Vega	81 07.5	+38 44.6
39	Zub'g'bi	137 52.5	−15 51.8

GMT	Equation of Time (App.—Mean) 17 m s	18 m s	19 m s
h			
0	− 0 40.7	− 0 53.6	− 1 06.5
6	− 0 43.9	− 0 56.8	− 1 09.7
12	− 0 47.1	− 1 00.0	− 1 13.0
18	− 0 50.3	− 1 03.3	− 1 16.2
24	− 0 53.6	− 1 06.5	− 1 19.5

Lat.	Sunrise	Twlt. begins	Moonrise 17	18	19	20
N °	h m	h m	h m	h m	h m	h m
72	□	□	16 32	18 55	▬	▬
70	□	□	16 07	18 05	20 27	▬
68	□	□	15 49	17 33	19 20	21 09
66	□	□	15 35	17 10	18 44	20 10
64	1 31	////	15 23	16 52	18 18	19 36
62	2 09	////	15 13	16 37	17 59	19 12
60	2 35	////	15 04	16 25	17 42	18 52
58	2 56	////	14 56	16 14	17 29	18 37
56	3 13	////	14 50	16 05	17 17	18 23
54	3 27	////	14 44	15 57	17 07	18 11
52	3 39	////	14 39	15 50	16 58	18 01
50	3 50	////	14 34	15 43	16 50	17 51
45	4 13	1 40	14 24	15 29	16 32	17 32
40	4 31	2 28	14 15	15 17	16 18	17 16
35	4 46	2 59	14 08	15 08	16 06	17 03
30	4 59	3 22	14 01	14 59	15 56	16 51
20	5 21	3 57	13 50	14 45	15 38	16 31
10	5 40	4 22	13 41	14 32	15 23	16 14
0	5 57	4 42	13 32	14 20	15 09	15 58
10	6 15	5 00	13 23	14 08	14 54	15 42
20	6 33	5 14	13 14	13 55	14 39	15 25
30	6 55	5 28	13 03	13 41	14 22	15 05
35	7 07	5 36	12 57	13 33	14 12	14 54
40	7 21	5 43	12 50	13 23	14 00	14 41
45	7 38	5 51	12 42	13 12	13 47	14 26
50	7 59	5 58	12 32	12 59	13 30	14 07
52	8 09	6 02	12 28	12 53	13 23	13 58
54	8 20	6 06	12 23	12 46	13 14	13 48
56	8 32	6 10	12 18	12 39	13 05	13 37
58	8 47	6 14	12 12	12 30	12 54	13 24
60	9 05	6 18	12 05	12 21	12 41	13 09

Lat.	Sunset	Twlt. ends	Moonset 17	18	19	20
N °	h m	h m	h m	h m	h m	h m
72	□	□	22 36	21 53	▬	▬
70	□	□	23 01	22 45	22 04	▬
68	□	□	23 21	23 17	23 12	23 06
66	□	□	23 37	23 41	23 49	24 05
64	22 31	////	23 50	24 00	0 00	0 15
62	21 53	////	24 01	0 01	0 15	0 35
60	21 27	////	24 10	0 10	0 28	0 52
58	21 06	////	0 02	0 19	0 39	1 06
56	20 50	////	0 07	0 26	0 49	1 18
54	20 35	////	0 11	0 32	0 58	1 28
52	20 23	////	0 15	0 38	1 06	1 38
50	20 12	////	0 19	0 44	1 13	1 46
45	19 49	22 22	0 26	0 55	1 28	2 04
40	19 31	21 34	0 33	1 05	1 40	2 19
35	19 16	21 03	0 39	1 13	1 51	2 31
30	19 03	20 40	0 44	1 21	2 00	2 42
20	18 41	20 05	0 52	1 33	2 16	3 01
10	18 22	19 40	1 00	1 44	2 30	3 17
0	18 05	19 20	1 07	1 55	2 43	3 32
10	17 47	19 02	1 14	2 05	2 56	3 48
20	17 29	18 48	1 22	2 16	3 10	4 04
30	17 08	18 34	1 31	2 29	3 27	4 23
35	16 55	18 26	1 36	2 37	3 36	4 34
40	16 41	18 19	1 42	2 45	3 47	4 46
45	16 24	18 11	1 49	2 55	4 00	5 01
50	16 03	18 03	1 57	3 07	4 15	5 19
52	15 54	18 00	2 00	3 13	4 22	5 28
54	15 42	17 56	2 05	3 19	4 31	5 38
56	15 30	17 52	2 09	3 26	4 40	5 49
58	15 15	17 48	2 14	3 34	4 50	6 01
60	14 58	17 44	2 20	3 43	5 02	6 16

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
17	19 43	12 33	5 00	16 13	21 59
18	20 31	12 27	4 58	16 10	21 55
19	21 20	12 20	4 56	16 07	21 50
20	22 10	12 13	4 54	16 03	21 46

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.1	0.5	0.2
30	0.1	0.4	0.2
45	0.1	0.3	0.1
60	0.1	0.2	0.1
75	0.1	0.1	0.0
90			

Moon's Lower Limb **Add**

Alt.	17	18	19
°	′	′	′
0	15.0	14.3	13.6
4	15.0	14.3	13.7
8	15.0	14.3	13.7
12	15.1	14.3	13.7
16	15.1	14.3	13.7
20	15.1	14.4	13.8
24	15.1	14.4	13.8
28	15.1	14.4	13.8
32	15.1	14.4	13.9
36	15.1	14.5	14.0
40	15.1	14.5	14.0
44	15.2	14.6	14.1
48	15.2	14.6	14.2
52	15.2	14.7	14.3
56	15.2	14.7	14.3
60	15.3	14.8	14.4
64	15.3	14.9	14.5
68	15.3	14.9	14.6
72	15.3	15.0	14.7
76	15.4	15.1	14.8
80	15.4	15.1	14.9
84	15.4	15.2	15.0
88	15.4	15.3	15.1
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	17	18	19
°	′	′	′
0	15.8	16.3	16.6
4	15.8	16.3	16.6
8	15.8	16.3	16.6
12	15.8	16.2	16.6
16	15.8	16.2	16.6
20	15.8	16.2	16.5
24	15.8	16.2	16.5
28	15.8	16.1	16.4
32	15.8	16.1	16.4
36	15.8	16.1	16.3
40	15.7	16.0	16.3
44	15.7	16.0	16.2
48	15.7	15.9	16.1
52	15.7	15.9	16.0
56	15.7	15.8	15.9
60	15.6	15.7	15.8
64	15.6	15.7	15.8
68	15.6	15.6	15.7
72	15.6	15.6	15.6
76	15.5	15.5	15.5
80	15.5	15.4	15.4
84	15.5	15.3	15.2
88	15.4	15.3	15.2
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −2.8 GHA	Dec.	MARS −0.7 GHA	Dec.	JUPITER −1.4 GHA	Dec.	SATURN 0.4 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
20 0	268 10.7	175 48.9	+21 48.8	286 27.6	−11 29.9	118 38.2	+13 27.7	32 30.8	−17 28.2	38 35.8	111	−19 45.2	− 53
1	283 13.2	190 53.1	48.2	301 28.8	29.6	133 40.3	27.6	47 33.4	28.1	53 05.9	111	19 50.5	− 51
2	298 15.6	205 57.2	47.7	316 30.1	29.2	148 42.4	27.4	62 36.0	28.1	67 36.0	111	19 55.6	− 51
3	313 18.1	221 01.4	·· 47.1	331 31.4	·· 28.8	163 44.4	·· 27.3	77 38.6	·· 28.1	82 06.1	111	·20 00.7	− 49
4	328 20.6	236 05.5	46.6	346 32.6	28.5	178 46.5	27.2	92 41.2	28.1	96 36.2	110	20 05.6	− 49
5	343 23.0	251 09.6	46.0	1 33.9	28.1	193 48.6	27.0	107 43.8	28.0	111 06.2	111	20 10.5	− 47
6	358 25.5	266 13.8	+21 45.4	16 35.2	−11 27.8	208 50.7	+13 26.9	122 46.5	−17 28.0	125 36.3	110	−20 15.2	− 47
7	13 28.0	281 17.9	44.9	31 36.4	27.4	223 52.8	26.7	137 49.1	28.0	140 06.3	110	20 19.9	− 45
8	28 30.4	296 22.1	44.3	46 37.7	27.1	238 54.9	26.6	152 51.7	28.0	154 36.3	110	20 24.4	− 45
9	43 32.9	311 26.2	·· 43.7	61 39.0	·· 26.7	253 57.0	·· 26.5	167 54.3	·· 27.9	169 06.3	110	·20 28.9	− 43
10	58 35.4	326 30.4	43.2	76 40.2	26.3	268 59.0	26.3	182 56.9	27.9	183 36.3	110	20 33.2	− 43
11	73 37.8	341 34.5	42.6	91 41.5	26.0	284 01.1	26.2	197 59.5	27.9	198 06.3	110	20 37.5	− 41
12	88 40.3	356 38.7	+21 42.1	106 42.8	−11 25.6	299 03.2	+13 26.0	213 02.1	−17 27.8	212 36.3	109	−20 41.6	− 40
13	103 42.8	11 42.8	41.5	121 44.0	25.3	314 05.3	25.9	228 04.7	27.8	227 06.2	110	20 45.6	− 39
14	118 45.2	26 46.9	40.9	136 45.3	24.9	329 07.4	25.8	243 07.3	27.8	241 36.2	109	20 49.5	− 39
15	133 47.7	41 51.1	·· 40.4	151 46.6	·· 24.6	344 09.5	·· 25.6	258 10.0	·· 27.8	256 06.1	109	·20 53.4	− 37
16	148 50.1	56 55.2	39.8	166 47.8	24.2	359 11.6	25.5	273 12.6	27.7	270 36.0	109	20 57.1	− 36
17	163 52.6	71 59.4	39.2	181 49.1	23.9	14 13.6	25.4	288 15.2	27.7	285 05.9	109	21 00.7	− 35
18	178 55.1	87 03.5	+21 38.7	196 50.4	−11 23.5	29 15.7	+13 25.2	303 17.8	−17 27.7	299 35.8	109	−21 04.2	− 34
19	193 57.5	102 07.7	38.1	211 51.7	23.1	44 17.8	25.1	318 20.4	27.7	314 05.7	109	21 07.6	− 33
20	209 00.0	117 11.8	37.6	226 52.9	22.8	59 19.9	24.9	333 23.0	27.6	328 35.6	109	21 10.9	− 32
21	224 02.5	132 16.0	·· 37.0	241 54.2	·· 22.4	74 22.0	·· 24.8	348 25.6	·· 27.6	343 05.5	109	·21 14.1	− 31
22	239 04.9	147 20.1	36.4	256 55.5	22.1	89 24.1	24.7	3 28.2	27.6	357 35.4	109	21 17.2	− 30
23	254 07.4	162 24.3	35.9	271 56.8	21.7	104 26.1	24.5	18 30.9	27.6	12 05.3	108	21 20.2	− 28
21 0	269 09.9	177 28.4	+21 35.3	286 58.0	−11 21.4	119 28.2	+13 24.4	33 33.5	−17 27.6	26 35.1	109	−21 23.0	− 28
1	284 12.3	192 32.6	34.7	301 59.3	21.0	134 30.3	24.2	48 36.1	27.5	41 05.0	108	21 25.8	− 27
2	299 14.8	207 36.7	34.2	317 00.6	20.7	149 32.4	24.1	63 38.7	27.5	55 34.8	109	21 28.5	− 25
3	314 17.2	222 40.9	·· 33.6	332 01.9	·· 20.3	164 34.5	·· 24.0	78 41.3	·· 27.5	70 04.7	108	·21 31.0	− 25
4	329 19.7	237 45.0	33.1	347 03.1	20.0	179 36.6	23.8	93 43.9	27.5	84 34.5	109	21 33.5	− 23
5	344 22.2	252 49.2	32.5	2 04.4	19.6	194 38.6	23.7	108 46.5	27.4	99 04.4	108	21 35.8	− 23
6	359 24.6	267 53.3	+21 31.9	17 05.7	−11 19.3	209 40.7	+13 23.5	123 49.1	−17 27.4	113 34.2	109	−21 38.1	− 21
7	14 27.1	282 57.5	31.4	32 07.0	18.9	224 42.8	23.4	138 51.7	27.4	128 04.1	108	21 40.2	− 20
8	29 29.6	298 01.6	30.8	47 08.2	18.5	239 44.9	23.3	153 54.3	27.4	142 33.9	109	21 42.2	− 19
9	44 32.0	313 05.8	·· 30.2	62 09.5	·· 18.2	254 47.0	·· 23.1	168 57.0	·· 27.3	157 03.8	108	·21 44.1	− 18
10	59 34.5	328 09.9	29.7	77 10.8	17.8	269 49.1	23.0	183 59.6	27.3	171 33.6	108	21 45.9	− 17
11	74 37.0	343 14.1	29.1	92 12.1	17.5	284 51.1	22.9	199 02.2	27.3	186 03.4	109	21 47.6	− 16
12	89 39.4	358 18.3	+21 28.5	107 13.4	−11 17.1	299 53.2	+13 22.7	214 04.8	−17 27.3	200 33.3	109	−21 49.2	− 15
13	104 41.9	13 22.4	28.0	122 14.6	16.8	314 55.3	22.6	229 07.4	27.2	215 03.2	108	21 50.7	− 14
14	119 44.4	28 26.6	27.4	137 15.9	16.4	329 57.4	22.4	244 10.0	27.2	229 33.0	109	21 52.1	− 13
15	134 46.8	43 30.7	·· 26.9	152 17.2	·· 16.1	344 59.5	·· 22.3	259 12.6	·· 27.2	244 02.9	108	·21 53.4	− 11
16	149 49.3	58 34.9	26.3	167 18.5	15.7	0 01.5	22.2	274 15.2	27.2	258 32.7	109	21 54.5	− 11
17	164 51.7	73 39.0	25.7	182 19.8	15.4	15 03.6	22.0	289 17.8	27.1	273 02.6	109	21 55.6	− 9
18	179 54.2	88 43.2	+21 25.2	197 21.1	−11 15.0	30 05.7	+13 21.9	304 20.4	−17 27.1	287 32.5	109	−21 56.5	− 9
19	194 56.7	103 47.3	24.6	212 22.3	14.7	45 07.8	21.7	319 23.0	27.1	302 02.4	108	21 57.4	− 7
20	209 59.1	118 51.5	24.0	227 23.6	14.3	60 09.9	21.6	334 25.7	27.1	316 32.2	109	21 58.1	− 6
21	225 01.6	133 55.6	·· 23.5	242 24.9	·· 14.0	75 11.9	·· 21.5	349 28.3	·· 27.0	331 02.1	110	·21 58.7	− 6
22	240 04.1	148 59.8	22.9	257 26.2	13.6	90 14.0	21.3	4 30.9	27.0	345 32.1	109	21 59.3	− 4
23	255 06.5	164 03.9	22.4	272 27.5	13.3	105 16.1	21.2	19 33.5	27.0	0 02.0	109	21 59.7	− 3
22 0	270 09.0	179 08.1	+21 21.8	287 28.8	−11 12.9	120 18.2	+13 21.0	34 36.1	−17 27.0	14 31.9	109	−22 00.0	− 2
1	285 11.5	194 12.2	21.2	302 30.1	12.6	135 20.3	20.9	49 38.7	26.9	29 01.8	110	22 00.2	− 1
2	300 13.9	209 16.4	20.7	317 31.4	12.2	150 22.3	20.7	64 41.3	26.9	43 31.8	110	22 00.3	0
3	315 16.4	224 20.5	·· 20.1	332 32.6	·· 11.9	165 24.4	·· 20.6	79 43.9	·· 26.9	58 01.8	109	·22 00.3	+ 2
4	330 18.9	239 24.7	19.6	347 33.9	11.5	180 26.5	20.5	94 46.5	26.9	72 31.7	110	22 00.1	+ 2
5	345 21.3	254 28.9	19.0	2 35.2	11.2	195 28.6	20.3	109 49.1	26.8	87 01.7	110	21 59.9	+ 3
6	0 23.8	269 33.0	+21 18.4	17 36.5	−11 10.8	210 30.7	+13 20.2	124 51.7	−17 26.8	101 31.7	110	−21 59.6	+ 4
7	15 26.2	284 37.2	17.9	32 37.8	10.5	225 32.7	20.0	139 54.3	26.8	116 01.7	111	21 59.2	+ 6
8	30 28.7	299 41.3	17.3	47 39.1	10.1	240 34.8	19.9	154 57.0	26.8	130 31.8	110	21 58.6	+ 6
9	45 31.2	314 45.5	·· 16.7	62 40.4	·· 09.8	255 36.9	·· 19.8	169 59.6	·· 26.8	145 01.8	111	·21 58.0	+ 8
10	60 33.6	329 49.6	16.2	77 41.7	09.4	270 39.0	19.6	185 02.2	26.7	159 31.9	111	21 57.2	+ 9
11	75 36.1	344 53.8	15.6	92 43.0	09.1	285 41.1	19.5	200 04.8	26.7	174 02.0	111	21 56.3	+ 9
12	90 38.6	359 57.9	+21 15.1	107 44.3	−11 08.7	300 43.1	+13 19.3	215 07.4	−17 26.7	188 32.1	111	−21 55.4	+ 11
13	105 41.0	15 02.1	14.5	122 45.6	08.4	315 45.2	19.2	230 10.0	26.7	203 02.2	112	21 54.3	+ 12
14	120 43.5	30 06.2	13.9	137 46.9	08.0	330 47.3	19.1	245 12.6	26.6	217 32.4	111	21 53.1	+ 13
15	135 46.0	45 10.4	·· 13.4	152 48.2	·· 07.7	345 49.4	·· 18.9	260 15.2	·· 26.6	232 02.5	112	·21 51.8	+ 13
16	150 48.4	60 14.5	12.8	167 49.4	07.4	0 51.4	18.8	275 17.8	26.6	246 32.7	112	21 50.5	+ 15
17	165 50.9	75 18.7	12.3	182 50.7	07.0	15 53.5	18.6	290 20.4	26.6	261 02.9	113	21 49.0	+ 16
18	180 53.4	90 22.8	+21 11.7	197 52.0	−11 06.7	30 55.6	+13 18.5	305 23.0	−17 26.5	275 33.2	112	−21 47.4	+ 17
19	195 55.8	105 27.0	11.1	212 53.3	06.3	45 57.7	18.3	320 25.6	26.5	290 03.4	113	21 45.7	+ 18
20	210 58.3	120 31.1	10.6	227 54.6	06.0	60 59.7	18.2	335 28.2	26.5	304 33.7	113	21 43.9	+ 19
21	226 00.7	135 35.3	·· 10.0	242 55.9	·· 05.6	76 01.8	·· 18.1	350 30.8	·· 26.5	319 04.0	113	·21 42.0	+ 20
22	241 03.2	150 39.4	09.5	257 57.2	05.3	91 03.9	17.9	5 33.4	26.4	333 34.3	114	21 40.0	+ 21
23	256 05.7	165 43.5	08.9	272 58.5	04.9	106 06.0	17.8	20 36.0	26.4	348 04.7	114	21 37.9	+ 22
24	271 08.1	180 47.7	+21 08.3	287 59.8	−11 04.6	121 08.1	+13 17.6	35 38.7	−17 26.4	2 35.1	114	−21 35.7	+ 23
code	−	+ 41	− 5	+ 12	+ 3	+ 21	− 1	+ 26	+ 1				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
20 0	179 40.1	+23 26.2	7	Acamar	315 51.0	−40 28.5
1	194 39.9	26.2	5	Achernar	335 58.7	−57 27.1
2	209 39.8	26.3	30	Acrux	173 57.0	−62 51.9
3	224 39.7	·· 26.3	19	Adhara	255 46.5	−28 54.8
4	239 39.5	26.3	10	Aldebaran	291 38.8	+16 25.3
5	254 39.4	26.3				
6	269 39.3	+23 26.3	32	Alioth	166 58.0	+56 11.9
7	284 39.1	26.4	34	Alkaid	153 32.3	+49 32.0
8	299 39.0	26.4	55	Al Na'ir	28 37.0	−47 10.0
9	314 38.9	·· 26.4	15	Alnilam	276 30.1	− 1 13.7
10	329 38.7	26.4	25	Alphard	218 38.3	− 8 28.3
11	344 38.6	26.4				
12	359 38.4	+23 26.4	41	Alphecca	126 46.9	+26 51.7
13	14 38.3	26.5	1	Alpheratz	358 27.7	+28 51.0
14	29 38.2	26.5	51	Altair	62 49.6	+ 8 45.2
15	44 38.0	·· 26.5	2	Ankaa	353 57.8	−42 32.2
16	59 37.9	26.5	42	Antares	113 18.3	−26 20.3
17	74 37.8	26.5				
18	89 37.6	+23 26.5	37	Arcturus	146 34.5	+19 24.5
19	104 37.5	26.5	43	Atria	108 58.0	−68 57.1
20	119 37.4	26.6	22	Avior	234 36.1	−59 22.4
21	134 37.2	·· 26.6	13	Bellatrix	279 18.2	+ 6 18.7
22	149 37.1	26.6	16	Betelg'se	271 47.9	+ 7 24.0
23	164 37.0	26.6				
			17	Canopus	264 15.7	−52 40.4
21 0	179 36.8	+23 26.6	12	Capella	281 38.1	+45 57.3
1	194 36.7	26.6	53	Deneb	50 00.2	+45 07.4
2	209 36.6	26.6	28	Denebola	183 17.2	+14 48.9
3	224 36.4	·· 26.6	4	Diphda	349 38.8	−18 13.3
4	239 36.3	26.6				
5	254 36.2	26.6	27	Dubhe	194 44.2	+61 59.4
6	269 36.0	+23 26.6	14	Elnath	279 07.0	+28 34.3
7	284 35.9	26.6	47	Eltanin	91 05.4	+51 29.7
8	299 35.7	26.6	54	Enif	34 28.8	+ 9 40.6
9	314 35.6	·· 26.6	56	Fomalhaut	16 10.9	−29 50.9
10	329 35.5	26.6				
11	344 35.3	26.6	31	Gacrux	172 48.5	−56 52.6
12	359 35.2	+23 26.6	29	Gienah	176 36.3	−17 18.2
13	14 35.1	26.6	35	Hadar	149 48.2	−60 10.2
14	29 34.9	26.6	6	Hamal	328 49.2	+23 15.4
15	44 34.8	·· 26.6	48	Kaus Aust.	84 40.0	−34 24.3
16	59 34.7	26.6				
17	74 34.5	26.6	40	Kochab	137 17.2	+74 20.2
18	89 34.4	+23 26.6	57	Markab	14 20.8	+14 58.3
19	104 34.3	26.6	8	Menkar	315 00.0	+ 3 55.2
20	119 34.1	26.6	36	Menkent	148 57.8	−36 09.6
21	134 34.0	·· 26.6	24	Miapl'dus	221 49.5	−69 32.6
22	149 33.9	26.6				
23	164 33.7	26.6	9	Mirfak	309 42.0	+49 42.3
			50	Nunki	76 50.8	−26 21.0
22 0	179 33.6	+23 26.6	52	Peacock	54 25.9	−56 52.3
1	194 33.5	26.6	21	Pollux	244 20.3	+28 07.9
2	209 33.3	26.5	20	Procyon	245 44.7	+ 5 20.2
3	224 33.2	·· 26.5				
4	239 33.1	26.5	46	R'alhague	96 45.8	+12 35.5
5	254 32.9	26.5	26	Regulus	208 29.1	+12 10.8
6	269 32.8	+23 26.5	11	Rigel	281 53.4	− 8 15.1
7	284 32.7	26.5	38	Rigil Kent.	140 49.7	−60 39.7
8	299 32.5	26.5	44	Sabik	103 01.2	−15 40.3
9	314 32.4	·· 26.4				
10	329 32.3	26.4	3	Schedar	350 29.4	+56 17.8
11	344 32.1	26.4	45	Shaula	97 19.5	−37 04.4
12	359 32.0	+23 26.4	18	Sirius	259 11.7	−16 39.4
13	14 31.9	26.4	33	Spica	159 16.2	−10 56.2
14	29 31.7	26.4	23	Suhail	223 24.2	−43 15.6
15	44 31.6	·· 26.3				
16	59 31.4	26.3	49	Vega	81 07.4	+38 44.6
17	74 31.3	26.3	39	Zub'g'bi	137 52.5	−15 51.8
18	89 31.2	+23 26.3				
19	104 31.0	26.3				
20	119 30.9	26.2				
21	134 30.8	·· 26.2				
22	149 30.6	26.2				
23	164 30.5	26.2				
24	179 30.4	+23 26.1				
code	—	0				

Lat.	Sunrise	Twlt. begins	Moonrise 20	21	22	23
N °	h m	h m	h m	h m	h m	h m
72	□	□	▬	▬	▬	▬
70	□	□	▬	▬	▬	▬
68	□	□	21 09	▬	23 09	23 02
66	□	□	20 10	21 19	22 00	22 21
64	1 31	////	19 36	20 40	21 24	21 52
62	2 09	////	19 12	20 13	20 59	21 30
60	2 35	////	18 52	19 52	20 39	21 13
58	2 56	////	18 37	19 35	20 22	20 58
56	3 13	////	18 23	19 20	20 08	20 45
54	3 27	////	18 11	19 08	19 56	20 34
52	3 39	////	18 01	18 57	19 45	20 24
50	3 50	////	17 51	18 47	19 35	20 16
45	4 13	1 40	17 32	18 26	19 15	19 57
40	4 31	2 28	17 16	18 10	18 59	19 42
35	4 46	2 59	17 03	17 56	18 45	19 29
30	4 59	3 22	16 51	17 44	18 33	19 18
20	5 21	3 57	16 31	17 23	18 12	18 59
10	5 40	4 22	16 14	17 05	17 54	18 42
0	5 58	4 43	15 58	16 48	17 37	18 26
10	6 15	5 00	15 42	16 31	17 21	18 10
20	6 34	5 15	15 25	16 13	17 03	17 54
30	6 55	5 29	15 05	15 52	16 42	17 34
35	7 08	5 36	14 54	15 40	16 30	17 23
40	7 22	5 43	14 41	15 27	16 16	17 10
45	7 39	5 51	14 26	15 10	16 00	16 54
50	7 59	5 59	14 07	14 50	15 40	16 36
52	8 09	6 03	13 58	14 40	15 30	16 27
54	8 20	6 06	13 48	14 29	15 19	16 17
56	8 33	6 11	13 37	14 17	15 07	16 05
58	8 48	6 15	13 24	14 03	14 53	15 52
60	9 05	6 19	13 09	13 46	14 36	15 37
S						

Lat.	Sunset	Twlt. ends	Moonset 20	21	22	23
N °	h m	h m	h m	h m	h m	h m
72	□	□	▬	▬	▬	▬
70	□	□	▬	▬	▬	▬
68	□	□	23 06	▬	▬	0 33
66	□	□	24 05	0 05	0 40	1 42
64	22 32	////	0 15	0 39	1 19	2 17
62	21 54	////	0 35	1 04	1 46	2 43
60	21 28	////	0 52	1 24	2 07	3 03
58	21 07	////	1 06	1 40	2 24	3 19
56	20 50	////	1 18	1 54	2 39	3 33
54	20 36	////	1 28	2 06	2 52	3 45
52	20 24	////	1 38	2 17	3 03	3 56
50	20 13	////	1 46	2 26	3 12	4 06
45	19 50	22 23	2 04	2 46	3 33	4 25
40	19 32	21 35	2 19	3 02	3 50	4 42
35	19 17	21 04	2 31	3 16	4 04	4 55
30	19 04	20 41	2 42	3 27	4 16	5 07
20	18 42	20 06	3 01	3 48	4 37	5 27
10	18 23	19 41	3 17	4 06	4 55	5 45
0	18 05	19 20	3 32	4 22	5 12	6 01
10	17 48	19 03	3 48	4 39	5 29	6 17
20	17 29	18 48	4 04	4 56	5 47	6 35
30	17 08	18 34	4 23	5 17	6 08	6 55
35	16 56	18 27	4 34	5 29	6 20	7 06
40	16 42	18 20	4 46	5 42	6 34	7 20
45	16 25	18 12	5 01	5 59	6 50	7 36
50	16 04	18 04	5 19	6 19	7 11	7 55
52	15 54	18 00	5 28	6 28	7 20	8 04
54	15 43	17 57	5 38	6 39	7 31	8 14
56	15 30	17 52	5 49	6 51	7 43	8 26
58	15 15	17 48	6 01	7 05	7 58	8 39
60	14 58	17 44	6 16	7 21	8 15	8 55
S						

GMT	Equation of Time (App.—Mean) 20	21	22
h	m s	m s	m s
0	− 1 19.5	− 1 32.4	− 1 45.4
6	− 1 22.7	− 1 35.7	− 1 48.6
12	− 1 25.9	− 1 38.9	− 1 51.8
18	− 1 29.2	− 1 42.1	− 1 55.0
24	− 1 32.4	− 1 45.4	− 1 58.2

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
20	22 10	12 13	4 54	16 03	21 46
21	23 00	12 07	4 52	16 00	21 42
22	23 49	12 00	4 50	15 57	21 38
23	24 38	11 54	4 48	15 53	21 34

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.1	0.5	0.2
30	0.1	0.4	0.2
45	0.1	0.3	0.1
60	0.1	0.2	0.1
75	0.1	0.1	0.0
90			

Moon's Lower Limb **Add**

Alt.	20	21	22
°	′	′	′
0	13.0	12.6	12.2
4	13.0	12.6	12.3
8	13.0	12.7	12.3
12	13.1	12.7	12.3
16	13.1	12.7	12.4
20	13.2	12.8	12.4
24	13.2	12.9	12.5
28	13.3	12.9	12.6
32	13.3	13.0	12.7
36	13.4	13.1	12.8
40	13.5	13.2	12.9
44	13.6	13.3	13.0
48	13.7	13.4	13.2
52	13.8	13.6	13.3
56	13.9	13.7	13.5
60	14.1	13.8	13.6
64	14.2	14.0	13.8
68	14.3	14.1	14.0
72	14.5	14.3	14.1
76	14.6	14.4	14.3
80	14.7	14.6	14.5
84	14.9	14.8	14.7
88	15.0	14.9	14.8
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	20	21	22
°	′	′	′
0	17.0	17.2	17.4
4	17.0	17.2	17.4
8	17.0	17.2	17.4
12	16.9	17.2	17.4
16	16.9	17.1	17.3
20	16.9	17.1	17.3
24	16.8	17.0	17.2
28	16.7	16.9	17.1
32	16.7	16.8	17.0
36	16.6	16.7	16.9
40	16.5	16.6	16.8
44	16.4	16.5	16.6
48	16.3	16.4	16.5
52	16.2	16.3	16.4
56	16.1	16.1	16.2
60	15.9	16.0	16.1
64	15.8	15.9	15.9
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.3	15.2	15.2
84	15.1	15.1	15.0
88	15.0	15.0	14.9
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −2.8 GHA	Dec.	MARS −0.8 GHA	Dec.	JUPITER −1.4 GHA	Dec.	SATURN 0.4 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
23 00	271 08.1	180 47.7	+21 08.3	287 59.8	−11 04.6	121 08.1	+13 17.6	35 38.7	−17 26.4	2 35.1	114	−21 35.7	+ 23
01	286 10.6	195 51.8	07.8	303 01.1	04.2	136 10.1	17.5	50 41.3	26.4	17 05.5	114	21 33.4	+ 24
02	301 13.1	210 56.0	07.2	318 02.4	03.9	151 12.2	17.4	65 43.9	26.4	31 35.9	115	21 31.0	+ 26
03	316 15.5	226 00.1	·· 06.7	333 03.7	·· 03.5	166 14.3	·· 17.2	80 46.5	·· 26.3	46 06.4	115	·21 28.4	+ 26
04	331 18.0	241 04.3	06.1	348 05.0	03.2	181 16.4	17.1	95 49.1	26.3	60 36.9	115	21 25.8	+ 27
05	346 20.5	256 08.4	05.5	3 06.3	02.9	196 18.4	16.9	110 51.7	26.3	75 07.4	115	21 23.1	+ 28
06	1 22.9	271 12.6	+21 05.0	18 07.6	−11 02.5	211 20.5	+13 16.8	125 54.3	−17 26.3	89 37.9	116	−21 20.3	+ 29
07	16 25.4	286 16.7	04.4	33 09.0	02.2	226 22.6	16.6	140 56.9	26.2	104 08.5	116	21 17.4	+ 30
08	31 27.9	301 20.8	03.9	48 10.3	01.8	241 24.7	16.5	155 59.5	26.2	118 39.1	117	21 14.4	+ 31
09	46 30.3	316 25.0	·· 03.3	63 11.6	·· 01.5	256 26.7	·· 16.4	171 02.1	·· 26.2	133 09.8	116	·21 11.3	+ 32
10	61 32.8	331 29.1	02.8	78 12.9	01.1	271 28.8	16.2	186 04.7	26.2	147 40.4	117	21 08.1	+ 33
11	76 35.2	346 33.3	02.2	93 14.2	00.8	286 30.9	16.1	201 07.3	26.1	162 11.1	118	21 04.8	+ 34
12	91 37.7	1 37.4	+21 01.6	108 15.5	−11 00.5	301 33.0	+13 15.9	216 09.9	−17 26.1	176 41.9	118	−21 01.4	+ 35
13	106 40.2	16 41.5	01.1	123 16.8	11 00.1	316 35.0	15.8	231 12.5	26.1	191 12.7	118	20 57.9	+ 36
14	121 42.6	31 45.7	00.5	138 18.1	10 59.8	331 37.1	15.6	246 15.1	26.1	205 43.5	118	20 54.3	+ 37
15	136 45.1	46 49.8	·21 00.0	153 19.4	·· 59.4	346 39.2	·· 15.5	261 17.7	·· 26.0	220 14.3	119	·20 50.6	+ 38
16	151 47.6	61 53.9	20 59.4	168 20.7	59.1	1 41.3	15.4	276 20.3	26.0	234 45.2	119	20 46.8	+ 39
17	166 50.0	76 58.1	58.9	183 22.0	58.7	16 43.3	15.2	291 22.9	26.0	249 16.1	119	20 42.9	+ 39
18	181 52.5	92 02.2	+20 58.3	198 23.3	−10 58.4	31 45.4	+13 15.1	306 25.5	−17 26.0	263 47.0	120	−20 39.0	+ 41
19	196 55.0	107 06.3	57.8	213 24.6	58.1	46 47.5	14.9	321 28.1	26.0	278 18.0	120	20 34.9	+ 42
20	211 57.4	122 10.5	57.2	228 26.0	57.7	61 49.5	14.8	336 30.7	25.9	292 49.0	121	20 30.7	+ 42
21	226 59.9	137 14.6	·· 56.6	243 27.3	·· 57.4	76 51.6	·· 14.6	351 33.3	·· 25.9	307 20.1	120	·20 26.5	+ 44
22	242 02.3	152 18.7	56.1	258 28.6	57.0	91 53.7	14.5	6 35.9	25.9	321 51.1	122	20 22.1	+ 44
23	257 04.8	167 22.8	55.5	273 29.9	56.7	106 55.8	14.4	21 38.5	25.9	336 22.3	121	20 17.7	+ 46
24 00	272 07.3	182 27.0	+20 55.0	288 31.2	−10 56.3	121 57.8	+13 14.2	36 41.1	−17 25.8	350 53.4	122	−20 13.1	+ 46
01	287 09.7	197 31.1	54.4	303 32.5	56.0	136 59.9	14.1	51 43.7	25.8	5 24.6	122	20 08.5	+ 47
02	302 12.2	212 35.2	53.9	318 33.8	55.7	152 02.0	13.9	66 46.4	25.8	19 55.8	123	20 03.8	+ 48
03	317 14.7	227 39.4	·· 53.3	333 35.1	·· 55.3	167 04.1	·· 13.8	81 49.0	·· 25.8	34 27.1	123	·19 59.0	+ 49
04	332 17.1	242 43.5	52.8	348 36.5	55.0	182 06.1	13.6	96 51.6	25.8	48 58.4	124	19 54.1	+ 50
05	347 19.6	257 47.6	52.2	3 37.8	54.6	197 08.2	13.5	111 54.2	25.7	63 29.8	124	19 49.1	+ 51
06	2 22.1	272 51.7	+20 51.7	18 39.1	−10 54.3	212 10.3	+13 13.4	126 56.8	−17 25.7	78 01.2	124	−19 44.0	+ 51
07	17 24.5	287 55.8	51.1	33 40.4	54.0	227 12.3	13.2	141 59.4	25.7	92 32.6	125	19 38.9	+ 53
08	32 27.0	303 00.0	50.6	48 41.7	53.6	242 14.4	13.1	157 02.0	25.7	107 04.1	125	19 33.6	+ 53
09	47 29.5	318 04.1	·· 50.0	63 43.0	·· 53.3	257 16.5	·· 12.9	172 04.6	·· 25.6	121 35.6	125	·19 28.3	+ 54
10	62 31.9	333 08.2	49.5	78 44.4	52.9	272 18.6	12.8	187 07.2	25.6	136 07.1	126	19 22.9	+ 55
11	77 34.4	348 12.3	48.9	93 45.7	52.6	287 20.6	12.6	202 09.8	25.6	150 38.7	126	19 17.4	+ 56
12	92 36.8	3 16.4	+20 48.4	108 47.0	−10 52.3	302 22.7	+13 12.5	217 12.4	−17 25.6	165 10.3	127	−19 11.8	+ 57
13	107 39.3	18 20.5	47.8	123 48.3	51.9	317 24.8	12.3	232 15.0	25.6	179 42.0	127	19 06.1	+ 57
14	122 41.8	33 24.6	47.3	138 49.6	51.6	332 26.8	12.2	247 17.6	25.5	194 13.7	127	19 00.4	+ 59
15	137 44.2	48 28.8	·· 46.7	153 51.0	·· 51.3	347 28.9	·· 12.1	262 20.2	·· 25.5	208 45.4	128	·18 54.5	+ 59
16	152 46.7	63 32.9	46.2	168 52.3	50.9	2 31.0	11.9	277 22.8	25.5	223 17.2	128	18 48.6	+ 60
17	167 49.2	78 37.0	45.6	183 53.6	50.6	17 33.0	11.8	292 25.4	25.5	237 49.0	129	18 42.6	+ 61
18	182 51.6	93 41.1	+20 45.1	198 54.9	−10 50.2	32 35.1	+13 11.6	307 28.0	−17 25.4	252 20.9	129	−18 36.5	+ 62
19	197 54.1	108 45.2	44.5	213 56.3	49.9	47 37.2	11.5	322 30.6	25.4	266 52.8	130	18 30.3	+ 62
20	212 56.6	123 49.3	44.0	228 57.6	49.6	62 39.3	11.3	337 33.2	25.4	281 24.8	130	18 24.1	+ 64
21	227 59.0	138 53.4	·· 43.4	243 58.9	·· 49.2	77 41.3	·· 11.2	352 35.8	·· 25.4	295 56.8	130	·18 17.7	+ 64
22	243 01.5	153 57.5	42.9	259 00.2	48.9	92 43.4	11.0	7 38.4	25.4	310 28.8	131	18 11.3	+ 65
23	258 04.0	169 01.6	42.3	274 01.6	48.6	107 45.5	10.9	22 41.0	25.3	325 00.9	131	18 04.8	+ 66
25 00	273 06.4	184 05.7	+20 41.8	289 02.9	−10 48.2	122 47.5	+13 10.7	37 43.6	−17 25.3	339 33.0	131	−17 58.2	+ 66
01	288 08.9	199 09.8	41.2	304 04.2	47.9	137 49.6	10.6	52 46.2	25.3	354 05.1	132	17 51.6	+ 67
02	303 11.3	214 13.9	40.7	319 05.5	47.6	152 51.7	10.5	67 48.8	25.3	8 37.3	132	17 44.9	+ 68
03	318 13.8	229 18.0	·· 40.2	334 06.9	·· 47.2	167 53.7	·· 10.3	82 51.4	·· 25.2	23 09.5	133	·17 38.1	+ 69
04	333 16.3	244 22.1	39.6	349 08.2	46.9	182 55.8	10.2	97 54.0	25.2	37 41.8	133	17 31.2	+ 70
05	348 18.7	259 26.1	39.1	4 09.5	46.5	197 57.9	10.0	112 56.6	25.2	52 14.1	134	17 24.2	+ 70
06	3 21.2	274 30.2	+20 38.5	19 10.9	−10 46.2	212 59.9	+13 09.9	127 59.2	−17 25.2	66 46.5	134	−17 17.2	+ 71
07	18 23.7	289 34.3	38.0	34 12.2	45.9	228 02.0	09.7	143 01.8	25.2	81 18.9	134	17 10.1	+ 72
08	33 26.1	304 38.4	37.4	49 13.5	45.5	243 04.1	09.6	158 04.4	25.1	95 51.3	135	17 02.9	+ 72
09	48 28.6	319 42.5	·· 36.9	64 14.9	·· 45.2	258 06.1	·· 09.4	173 07.0	·· 25.1	110 23.8	135	·16 55.7	+ 73
10	63 31.1	334 46.6	36.3	79 16.2	44.9	273 08.2	09.3	188 09.6	25.1	124 56.3	136	16 48.4	+ 74
11	78 33.5	349 50.7	35.8	94 17.5	44.5	288 10.3	09.2	203 12.2	25.1	139 28.9	136	16 41.0	+ 75
12	93 36.0	4 54.7	+20 35.3	109 18.9	−10 44.2	303 12.4	+13 09.0	218 14.8	−17 25.0	154 01.5	136	−16 33.5	+ 75
13	108 38.4	19 58.8	34.7	124 20.2	43.9	318 14.4	08.9	233 17.4	25.0	168 34.1	137	16 26.0	+ 76
14	123 40.9	35 02.9	34.2	139 21.5	43.5	333 16.5	08.7	248 20.0	25.0	183 06.8	137	16 18.4	+ 77
15	138 43.4	50 07.0	·· 33.6	154 22.9	·· 43.2	348 18.6	·· 08.6	263 22.5	·· 25.0	197 39.5	138	·16 10.7	+ 77
16	153 45.8	65 11.0	33.1	169 24.2	42.9	3 20.6	08.4	278 25.1	25.0	212 12.3	138	16 03.0	+ 78
17	168 48.3	80 15.1	32.6	184 25.5	42.5	18 22.7	08.3	293 27.7	24.9	226 45.1	138	15 55.2	+ 79
18	183 50.8	95 19.2	+20 32.0	199 26.9	−10 42.2	33 24.8	+13 08.1	308 30.3	−17 24.9	241 17.9	139	−15 47.3	+ 79
19	198 53.2	110 23.2	31.5	214 28.2	41.9	48 26.8	08.0	323 32.9	24.9	255 50.8	139	15 39.4	+ 81
20	213 55.7	125 27.3	30.9	229 29.5	41.5	63 28.9	07.8	338 35.5	24.9	270 23.7	139	15 31.3	+ 80
21	228 58.2	140 31.4	·· 30.4	244 30.9	·· 41.2	78 31.0	·· 07.7	353 38.1	·· 24.9	284 56.6	140	·15 23.3	+ 82
22	244 00.6	155 35.4	29.9	259 32.2	40.9	93 33.0	07.5	8 40.7	24.8	299 29.6	141	15 15.1	+ 82
23	259 03.1	170 39.5	29.3	274 33.6	40.5	108 35.1	07.4	23 43.3	24.8	314 02.7	140	15 06.9	+ 82
24	274 05.6	185 43.5	+20 28.8	289 34.9	−10 40.2	123 37.1	+13 07.3	38 45.9	−17 24.8	328 35.7	141	−14 58.7	+ 84
code	−	+ 41	− 6	+ 13	+ 4	+ 21	− 2	+ 26	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
23 0	179 30.4	+23 26.1	7	Acamar	315 51.0	−40 28.5
1	194 30.2	26.1	5	Achernar	335 58.7	−57 27.1
2	209 30.1	26.1	30	Acrux	173 57.1	−62 51.9
3	224 30.0	·· 26.0	19	Adhara	255 46.5	−28 54.8
4	239 29.8	26.0	10	Aldebaran	291 38.7	+16 25.3
5	254 29.7	26.0				
6	269 29.6	+23 26.0	32	Alioth	166 58.0	+56 11.9
7	284 29.4	25.9	34	Alkaid	153 32.3	+49 32.0
8	299 29.3	25.9	55	Al Na'ir	28 37.0	−47 10.0
9	314 29.2	·· 25.9	15	Alnilam	276 30.0	− 1 13.7
10	329 29.0	25.8	25	Alphard	218 38.3	− 8 28.3
11	344 28.9	25.8				
12	359 28.8	+23 25.8	41	Alphecca	126 46.9	+26 51.7
13	14 28.6	25.7	1	Alpheratz	358 27.7	+28 51.0
14	29 28.5	25.7	51	Altair	62 49.6	+ 8 45.2
15	44 28.4	·· 25.6	2	Ankaa	353 57.8	−42 32.2
16	59 28.2	25.6	42	Antares	113 18.3	−26 20.3
17	74 28.1	25.6				
18	89 28.0	+23 25.5	37	Arcturus	146 34.5	+19 24.6
19	104 27.8	25.5	43	Atria	108 58.0	−68 57.1
20	119 27.7	25.4	22	Avior	234 36.1	−59 22.4
21	134 27.6	·· 25.4	13	Bellatrix	279 18.2	+ 6 18.7
22	149 27.4	25.4	16	Betelg'se	271 47.9	+ 7 24.0
23	164 27.3	25.3				
			17	Canopus	264 15.7	−52 40.4
24 0	179 27.2	+23 25.3	12	Capella	281 38.1	+45 57.3
1	194 27.0	25.2	53	Deneb	50 00.2	+45 07.4
2	209 26.9	25.2	28	Denebola	183 17.2	+14 48.9
3	224 26.8	·· 25.1	4	Diphda	349 38.7	−18 13.3
4	239 26.6	25.1				
5	254 26.5	25.0	27	Dubhe	194 44.2	+61 59.3
6	269 26.4	+23 25.0	14	Elnath	279 07.0	+28 34.3
7	284 26.2	25.0	47	Eltanin	91 05.4	+51 29.7
8	299 26.1	24.9	54	Enif	34 28.8	+ 9 40.6
9	314 26.0	·· 24.9	56	Fomalhaut	16 10.9	−29 50.9
10	329 25.8	24.8				
11	344 25.7	24.7	31	Gacrux	172 48.5	−56 52.6
12	359 25.6	+23 24.7	29	Gienah	176 36.3	−17 18.2
13	14 25.5	24.6	35	Hadar	149 48.3	−60 10.2
14	29 25.3	24.6	6	Hamal	328 49.2	+23 15.4
15	44 25.2	·· 24.5	48	Kaus Aust.	84 40.0	−34 24.3
16	59 25.1	24.5				
17	74 24.9	24.4	40	Kochab	137 17.3	+74 20.2
18	89 24.8	+23 24.4	57	Markab	14 20.8	+14 58.3
19	104 24.7	24.3	8	Menkar	315 00.0	+ 3 55.2
20	119 24.5	24.3	36	Menkent	148 57.8	−36 09.6
21	134 24.4	·· 24.2	24	Miapl'dus	221 49.5	−69 32.6
22	149 24.3	24.1				
23	164 24.1	24.1	9	Mirfak	309 41.9	+49 42.3
			50	Nunki	76 50.8	−26 21.0
25 0	179 24.0	+23 24.0	52	Peacock	54 25.9	−56 52.3
1	194 23.9	24.0	21	Pollux	244 20.3	+28 07.9
2	209 23.7	23.9	20	Procyon	245 44.7	+ 5 20.2
3	224 23.6	·· 23.8				
4	239 23.5	23.8	46	R'alhague	96 45.7	+12 35.5
5	254 23.3	23.7	26	Regulus	208 29.1	+12 10.8
6	269 23.2	+23 23.6	11	Rigel	281 53.4	− 8 15.1
7	284 23.1	23.6	38	Rigil Kent.	140 49.8	−60 39.7
8	299 22.9	23.5	44	Sabik	103 01.2	−15 40.3
9	314 22.8	·· 23.4				
10	329 22.7	23.4	3	Schedar	350 29.4	+56 17.8
11	344 22.5	23.3	45	Shaula	97 19.5	−37 04.4
12	359 22.4	+23 23.2	18	Sirius	259 11.7	−16 39.4
13	14 22.3	23.2	33	Spica	159 16.2	−10 56.2
14	29 22.2	23.1	23	Suhail	223 24.2	−43 15.6
15	44 22.0	·· 23.0				
16	59 21.9	22.9	49	Vega	81 07.4	+38 44.6
17	74 21.8	22.9	39	Zub'g'bi	137 52.5	−15 51.8
18	89 21.6	+23 22.8				
19	104 21.5	22.7				
20	119 21.4	22.6				
21	134 21.2	·· 22.6				
22	149 21.1	22.5				
23	164 21.0	22.4				
24	179 20.8	+23 22.3				
code	—	− 1				

Lat. N °	Sunrise h m	Twlt. begins h m	Moonrise 23 h m	24 h m	25 h m	26 h m
72	□	□	■	■	(1 05 / 123 50)	23 23
70	□	□	■	23 37	23 17	23 04
68	□	□	23 02	22 57	22 53	22 49
66	□	□	22 21	22 30	22 34	22 37
64	1 32	////	21 52	22 09	22 19	22 26
62	2 10	////	21 30	21 52	22 07	22 17
60	2 37	////	21 13	21 38	21 56	22 10
58	2 57	////	20 58	21 25	21 46	22 03
56	3 14	////	20 45	21 15	21 38	21 57
54	3 28	////	20 34	21 05	21 31	21 51
52	3 40	////	20 24	20 57	21 24	21 47
50	3 51	////	20 16	20 50	21 18	21 42
45	4 14	1 41	19 57	20 33	21 05	21 33
40	4 32	2 29	19 42	20 20	20 54	21 24
35	4 47	3 00	19 29	20 09	20 45	21 18
30	5 00	3 23	19 18	19 59	20 37	21 11
20	5 22	3 58	18 59	19 42	20 23	21 01
10	5 41	4 23	18 42	19 27	20 10	20 51
0	5 59	4 43	18 26	19 13	19 59	20 43
10	6 16	5 01	18 10	18 59	19 47	20 34
20	6 35	5 15	17 54	18 44	19 35	20 25
30	6 56	5 30	17 34	18 27	19 21	20 14
35	7 08	5 37	17 23	18 17	19 12	20 07
40	7 23	5 44	17 10	18 06	19 03	20 00
45	7 39	5 52	16 54	17 52	18 52	19 52
50	8 00	6 00	16 36	17 36	18 38	19 42
52	8 10	6 04	16 27	17 28	18 32	19 37
54	8 21	6 07	16 17	17 19	18 25	19 32
56	8 34	6 12	16 05	17 09	18 17	19 27
58	8 48	6 15	15 52	16 58	18 08	19 20
60	9 06	6 20	15 37	16 45	17 58	19 13

Lat. N °	Sunset h m	Twlt. ends h m	Moonset 23 h m	24 h m	25 h m	26 h m
72	□	□	■	■	1 57	4 45
70	□	□	■	■	3 24	5 17
68	□	□	0 33	2 21	4 02	5 40
66	□	□	1 42	3 02	4 29	5 57
64	22 32	////	2 17	3 30	4 50	6 12
62	21 54	////	2 43	3 51	5 06	6 24
60	21 28	////	3 03	4 08	5 20	6 34
58	21 07	////	3 19	4 23	5 31	6 43
56	20 51	////	3 33	4 35	5 41	6 50
54	20 36	////	3 45	4 46	5 50	6 57
52	20 24	////	3 56	4 55	5 58	7 03
50	20 13	////	4 06	5 04	6 05	7 09
45	19 51	22 24	4 25	5 22	6 21	7 21
40	19 33	21 36	4 42	5 36	6 33	7 31
35	19 18	21 05	4 55	5 49	6 44	7 39
30	19 05	20 42	5 07	6 00	6 53	7 46
20	18 43	20 07	5 27	6 18	7 09	7 59
10	18 24	19 42	5 45	6 34	7 23	8 10
0	18 06	19 21	6 01	6 49	7 35	8 20
10	17 49	19 04	6 17	7 04	7 48	8 30
20	17 30	18 49	6 35	7 20	8 02	8 41
30	17 09	18 35	6 55	7 38	8 17	8 53
35	16 57	18 28	7 06	7 49	8 26	9 01
40	16 42	18 20	7 20	8 01	8 37	9 09
45	16 26	18 13	7 36	8 15	8 49	9 18
50	16 05	18 05	7 55	8 32	9 03	9 29
52	15 55	18 01	8 04	8 40	9 10	9 34
54	15 44	17 58	8 14	8 49	9 17	9 40
56	15 31	17 53	8 26	8 59	9 25	9 46
58	15 16	17 49	8 39	9 11	9 35	9 53
60	14 59	17 45	8 55	9 24	9 45	10 01

GMT	Equation of Time (App.—Mean) 23 m s	24 m s	25 m s
h			
0	− 1 58.2	− 2 11.0	− 2 23.8
6	− 2 01.4	− 2 14.2	− 2 26.9
12	− 2 04.6	− 2 17.4	− 2 30.1
18	− 2 07.8	− 2 20.6	− 2 33.2
24	− 2 11.0	− 2 23.8	− 2 36.4

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
23	24 38	11 54	4 48	15 53	21 34
24	0 38	11 47	4 46	15 50	21 30
25	1 24	11 40	4 43	15 47	21 25
26	2 10	11 34	4 41	15 43	21 21

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.1	0.5	0.2
30	0.1	0.4	0.2
45	0.1	0.3	0.1
60	0.1	0.2	0.1
75	0.1	0.1	0.0
90			

Moon's Lower Limb **Add**

Alt.	23	24	25
°	′	′	′
0	12.0	11.7	11.7
4	12.0	11.7	11.7
8	12.0	11.8	11.8
12	12.1	11.8	11.8
16	12.1	11.9	11.9
20	12.2	12.0	12.0
24	12.3	12.0	12.0
28	12.4	12.1	12.1
32	12.5	12.2	12.2
36	12.6	12.4	12.4
40	12.7	12.5	12.5
44	12.8	12.6	12.6
48	13.0	12.8	12.8
52	13.1	13.0	13.0
56	13.3	13.1	13.1
60	13.5	13.3	13.3
64	13.6	13.5	13.5
68	13.8	13.7	13.7
72	14.0	13.9	13.9
76	14.2	14.1	14.1
80	14.4	14.3	14.3
84	14.6	14.5	14.5
88	14.7	14.7	14.7
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	23	24	25
°	′	′	′
0	17.6	17.7	17.7
4	17.6	17.7	17.7
8	17.5	17.7	17.7
12	17.5	17.6	17.6
16	17.5	17.6	17.6
20	17.4	17.5	17.5
24	17.3	17.4	17.4
28	17.2	17.3	17.3
32	17.1	17.2	17.2
36	17.0	17.1	17.1
40	16.9	17.0	17.0
44	16.7	16.8	16.8
48	16.6	16.7	16.7
52	16.4	16.5	16.5
56	16.3	16.3	16.3
60	16.1	16.1	16.1
64	15.9	16.0	16.0
68	15.7	15.8	15.8
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.2
84	15.0	14.9	14.9
88	14.8	14.8	14.8
90			

Subtract from table, back cover

Full Moon 23

GMT	♈ GHA	VENUS −3.1 GHA	Dec.	MARS −0.9 GHA	Dec.	JUPITER −1.4 GHA	Dec.	SATURN 0.4 GHA	Dec.	MOON GHA	code	Dec.	code
	h ° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
26	0 274 05.6	185 43.5	+20 28.8	289 34.9	−10 40.2	123 37.1	+13 07.3	38 45.9	−17 24.8	328 35.7	141	−14 58.7	+ 84
	1 289 08.0	200 47.6	28.3	304 36.2	39.9	138 39.2	07.1	53 48.5	24.8	343 08.8	142	14 50.3	+ 83
	2 304 10.5	215 51.7	27.7	319 37.6	39.6	153 41.3	07.0	68 51.1	24.8	357 42.0	141	14 42.0	+ 85
	3 319 12.9	230 55.7	27.2	334 38.9	39.2	168 43.3	06.8	83 53.7	24.7	12 15.1	142	14 33.5	+ 85
	4 334 15.4	245 59.8	26.7	349 40.3	38.9	183 45.4	06.7	98 56.3	24.7	26 48.3	143	14 25.0	+ 86
	5 349 17.9	261 03.8	26.1	4 41.6	38.6	198 47.5	06.5	113 58.9	24.7	41 21.6	142	14 16.4	+ 86
	6 4 20.3	276 07.9	+20 25.6	19 43.0	−10 38.2	213 49.5	+13 06.4	129 01.5	−17 24.7	55 54.8	144	−14 07.8	+ 87
	7 19 22.8	291 11.9	25.1	34 44.3	37.9	228 51.6	06.2	144 04.1	24.6	70 28.2	143	13 59.1	+ 88
	8 34 25.3	306 16.0	24.5	49 45.6	37.6	243 53.7	06.1	159 06.7	24.6	85 01.5	144	13 50.3	+ 88
	9 49 27.7	321 20.0	24.0	64 47.0	37.2	258 55.7	05.9	174 09.3	24.6	99 34.9	144	13 41.5	+ 88
	10 64 30.2	336 24.0	23.5	79 48.3	36.9	273 57.8	05.8	189 11.9	24.6	114 08.3	144	13 32.7	+ 90
	11 79 32.7	351 28.1	22.9	94 49.7	36.6	288 59.9	05.6	204 14.5	24.6	128 41.7	145	13 23.7	+ 89
	12 94 35.1	6 32.1	+20 22.4	109 51.0	−10 36.3	304 01.9	+13 05.5	219 17.1	−17 24.5	143 15.2	145	−13 14.8	+ 91
	13 109 37.6	21 36.1	21.9	124 52.4	35.9	319 04.0	05.3	234 19.7	24.5	157 48.7	146	13 05.7	+ 90
	14 124 40.1	36 40.2	21.3	139 53.7	35.6	334 06.1	05.2	249 22.3	24.5	172 22.3	146	12 56.7	+ 92
	15 139 42.5	51 44.2	20.8	154 55.1	35.3	349 08.1	05.0	264 24.9	24.5	186 55.9	146	12 47.5	+ 92
	16 154 45.0	66 48.2	20.3	169 56.4	34.9	4 10.2	04.9	279 27.5	24.5	201 29.5	146	12 38.3	+ 92
	17 169 47.4	81 52.3	19.8	184 57.8	34.6	19 12.2	04.8	294 30.0	24.4	216 03.1	147	12 29.1	+ 93
	18 184 49.9	96 56.3	+20 19.2	199 59.1	−10 34.3	34 14.3	+13 04.6	309 32.6	−17 24.4	230 36.8	147	−12 19.8	+ 94
	19 199 52.4	112 00.3	18.7	215 00.5	34.0	49 16.4	04.5	324 35.2	24.4	245 10.5	147	12 10.4	+ 94
	20 214 54.8	127 04.3	18.2	230 01.8	33.6	64 18.4	04.3	339 37.8	24.4	259 44.2	147	12 01.0	+ 94
	21 229 57.3	142 08.3	17.7	245 03.2	33.3	79 20.5	04.2	354 40.4	24.4	274 17.9	148	11 51.6	+ 95
	22 244 59.8	157 12.3	17.1	260 04.5	33.0	94 22.6	04.0	9 43.0	24.3	288 51.7	148	11 42.1	+ 96
	23 260 02.2	172 16.3	16.6	275 05.9	32.7	109 24.6	03.9	24 45.6	24.3	303 25.5	149	11 32.5	+ 96
27	0 275 04.7	187 20.4	+20 16.1	290 07.2	−10 32.3	124 26.7	+13 03.7	39 48.2	−17 24.3	317 59.4	148	−11 22.9	+ 96
	1 290 07.2	202 24.4	15.6	305 08.6	32.0	139 28.7	03.6	54 50.8	24.3	332 33.2	149	11 13.3	+ 97
	2 305 09.6	217 28.4	15.0	320 10.0	31.7	154 30.8	03.4	69 53.4	24.3	347 07.1	149	11 03.6	+ 98
	3 320 12.1	232 32.4	14.5	335 11.3	31.4	169 32.9	03.3	84 56.0	24.2	1 41.0	150	10 53.8	+ 98
	4 335 14.6	247 36.4	14.0	350 12.7	31.0	184 34.9	03.1	99 58.6	24.2	16 15.0	149	10 44.0	+ 98
	5 350 17.0	262 40.4	13.5	5 14.0	30.7	199 37.0	03.0	115 01.2	24.2	30 48.9	150	10 34.2	+ 99
	6 5 19.5	277 44.4	+20 13.0	20 15.4	−10 30.4	214 39.1	+13 02.8	130 03.8	−17 24.2	45 22.9	150	−10 24.3	+ 99
	7 20 21.9	292 48.4	12.4	35 16.7	30.1	229 41.1	02.7	145 06.4	24.2	59 56.9	150	10 14.4	+100
	8 35 24.4	307 52.4	11.9	50 18.1	29.7	244 43.2	02.5	160 08.9	24.1	74 30.9	151	10 04.4	+100
	9 50 26.9	322 56.4	11.4	65 19.5	29.4	259 45.2	02.4	175 11.5	24.1	89 05.0	151	9 54.4	+100
	10 65 29.3	338 00.3	10.9	80 20.8	29.1	274 47.3	02.2	190 14.1	24.1	103 39.1	150	9 44.4	+101
	11 80 31.8	353 04.3	10.4	95 22.2	28.8	289 49.4	02.1	205 16.7	24.1	118 13.1	152	9 34.3	+102
	12 95 34.3	8 08.3	+20 09.9	110 23.5	−10 28.4	304 51.4	+13 01.9	220 19.3	−17 24.1	132 47.3	151	− 9 24.1	+101
	13 110 36.7	23 12.3	09.3	125 24.9	28.1	319 53.5	01.8	235 21.9	24.0	147 21.4	151	9 14.0	+103
	14 125 39.2	38 16.3	08.8	140 26.3	27.8	334 55.5	01.6	250 24.5	24.0	161 55.5	152	9 03.7	+102
	15 140 41.7	53 20.2	08.3	155 27.6	27.5	349 57.6	01.5	265 27.1	24.0	176 29.7	152	8 53.5	+103
	16 155 44.1	68 24.2	07.8	170 29.0	27.1	4 59.7	01.3	280 29.7	24.0	191 03.9	152	8 43.2	+103
	17 170 46.6	83 28.2	07.3	185 30.4	26.8	20 01.7	01.2	295 32.3	24.0	205 38.1	152	8 32.9	+104
	18 185 49.0	98 32.1	+20 06.8	200 31.7	−10 26.5	35 03.8	+13 01.0	310 34.9	−17 23.9	220 12.3	152	− 8 22.5	+104
	19 200 51.5	113 36.1	06.3	215 33.1	26.2	50 05.8	00.9	325 37.5	23.9	234 46.5	153	8 12.1	+105
	20 215 54.0	128 40.1	05.7	230 34.5	25.9	65 07.9	00.7	340 40.0	23.9	249 20.8	152	8 01.6	+105
	21 230 56.4	143 44.0	05.2	245 35.8	25.5	80 10.0	00.6	355 42.6	23.9	263 55.0	153	7 51.1	+105
	22 245 58.9	158 48.0	04.7	260 37.2	25.2	95 12.0	00.4	10 45.2	23.9	278 29.3	153	7 40.6	+105
	23 261 01.4	173 51.9	04.2	275 38.6	24.9	110 14.1	00.3	25 47.8	23.8	293 03.6	153	7 30.1	+106
28	0 276 03.8	188 55.9	+20 03.7	290 39.9	−10 24.6	125 16.1	+13 00.1	40 50.4	−17 23.8	307 37.9	153	− 7 19.5	+106
	1 291 06.3	203 59.8	03.2	305 41.3	24.3	140 18.2	13 00.0	55 53.0	23.8	322 12.2	153	7 08.9	+107
	2 306 08.8	219 03.8	02.7	320 42.7	23.9	155 20.2	12 59.9	70 55.6	23.8	336 46.5	153	6 58.2	+106
	3 321 11.2	234 07.7	02.2	335 44.0	23.6	170 22.3	59.7	85 58.2	23.8	351 20.8	154	6 47.6	+108
	4 336 13.7	249 11.7	01.7	350 45.4	23.3	185 24.4	59.6	101 00.8	23.7	5 55.2	153	6 36.8	+107
	5 351 16.2	264 15.6	01.2	5 46.8	23.0	200 26.4	59.4	116 03.4	23.7	20 29.5	153	6 26.1	+108
	6 6 18.6	279 19.5	+20 00.7	20 48.2	−10 22.7	215 28.5	+12 59.3	131 05.9	−17 23.7	35 03.8	154	− 6 15.3	+108
	7 21 21.1	294 23.5	20 00.2	35 49.5	22.3	230 30.5	59.1	146 08.5	23.7	49 38.2	154	6 04.5	+108
	8 36 23.5	309 27.4	19 59.7	50 50.9	22.0	245 32.6	59.0	161 11.1	23.7	64 12.6	153	5 53.7	+109
	9 51 26.0	324 31.3	59.2	65 52.3	21.7	260 34.7	58.8	176 13.7	23.6	78 46.9	154	5 42.8	+109
	10 66 28.5	339 35.3	58.6	80 53.7	21.4	275 36.7	58.7	191 16.3	23.6	93 21.3	154	5 31.9	+109
	11 81 30.9	354 39.2	58.1	95 55.0	21.1	290 38.8	58.5	206 18.9	23.6	107 55.7	153	5 21.0	+109
	12 96 33.4	9 43.1	+19 57.6	110 56.4	−10 20.7	305 40.8	+12 58.4	221 21.5	−17 23.6	122 30.0	154	− 5 10.1	+110
	13 111 35.9	24 47.0	57.1	125 57.8	20.4	320 42.9	58.2	236 24.1	23.6	137 04.4	154	4 59.1	+110
	14 126 38.3	39 50.9	56.6	140 59.2	20.1	335 44.9	58.1	251 26.7	23.5	151 38.8	154	4 48.1	+110
	15 141 40.8	54 54.9	56.1	156 00.5	19.8	350 47.0	57.9	266 29.3	23.5	166 13.2	153	4 37.1	+111
	16 156 43.3	69 58.8	55.6	171 01.9	19.5	5 49.1	57.8	281 31.8	23.5	180 47.5	154	4 26.0	+110
	17 171 45.7	85 02.7	55.2	186 03.3	19.2	20 51.1	57.6	296 34.4	23.5	195 21.9	154	4 15.0	+111
	18 186 48.2	100 06.6	+19 54.7	201 04.7	−10 18.8	35 53.2	+12 57.5	311 37.0	−17 23.5	209 56.3	154	− 4 03.9	+111
	19 201 50.7	115 10.5	54.2	216 06.1	18.5	50 55.2	57.3	326 39.6	23.4	224 30.7	153	3 52.8	+112
	20 216 53.1	130 14.4	53.7	231 07.4	18.2	65 57.3	57.2	341 42.2	23.4	239 05.0	154	3 41.6	+111
	21 231 55.6	145 18.3	53.2	246 08.8	17.9	80 59.3	57.0	356 44.8	23.4	253 39.4	153	3 30.5	+112
	22 246 58.0	160 22.1	52.7	261 10.2	17.6	96 01.4	56.8	11 47.4	23.4	268 13.7	154	3 19.3	+112
	23 262 00.5	175 26.0	52.2	276 11.6	17.3	111 03.4	56.7	26 50.0	23.4	282 48.1	153	3 08.1	+112
	24 277 03.0	190 29.9	+19 51.7	291 13.0	−10 16.9	126 05.5	+12 56.5	41 52.5	−17 23.4	297 22.4	153	− 2 56.9	+113
	code —	+ 40	− 6	+ 14	+ 3	+ 21	− 1	+ 26	+ 1				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
26 0	179 20.8	+23 22.3
1	194 20.7	22.3
2	209 20.6	22.2
3	224 20.4	22.1
4	239 20.3	22.0
5	254 20.2	21.9
6	269 20.1	+23 21.9
7	284 19.9	21.8
8	299 19.8	21.7
9	314 19.7	21.6
10	329 19.5	21.5
11	344 19.4	21.4
12	359 19.3	+23 21.3
13	14 19.1	21.3
14	29 19.0	21.2
15	44 18.9	21.1
16	59 18.8	21.0
17	74 18.6	20.9
18	89 18.5	+23 20.8
19	104 18.4	20.7
20	119 18.2	20.6
21	134 18.1	20.5
22	149 18.0	20.4
23	164 17.8	20.3
27 0	179 17.7	+23 20.3
1	194 17.6	20.2
2	209 17.5	20.1
3	224 17.3	20.0
4	239 17.2	19.9
5	254 17.1	19.8
6	269 16.9	+23 19.7
7	284 16.8	19.6
8	299 16.7	19.5
9	314 16.6	19.4
10	329 16.4	19.3
11	344 16.3	19.2
12	359 16.2	+23 19.1
13	14 16.0	18.9
14	29 15.9	18.8
15	44 15.8	18.7
16	59 15.7	18.6
17	74 15.5	18.5
18	89 15.4	+23 18.4
19	104 15.3	18.3
20	119 15.1	18.2
21	134 15.0	18.1
22	149 14.9	18.0
23	164 14.8	17.9
28 0	179 14.6	+23 17.8
1	194 14.5	17.6
2	209 14.4	17.5
3	224 14.3	17.4
4	239 14.1	17.3
5	254 14.0	17.2
6	269 13.9	+23 17.1
7	284 13.7	16.9
8	299 13.6	16.8
9	314 13.5	16.7
10	329 13.4	16.6
11	344 13.2	16.5
12	359 13.1	+23 16.4
13	14 13.0	16.2
14	29 12.9	16.1
15	44 12.7	16.0
16	59 12.6	15.9
17	74 12.5	15.7
18	89 12.3	+23 15.6
19	104 12.2	15.5
20	119 12.1	15.4
21	134 12.0	15.2
22	149 11.8	15.1
23	164 11.7	15.0
24	179 11.6	+23 14.8
code	—	− 2

No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 51.0	−40 28.5
5	Achernar	335 58.7	−57 27.1
30	Acrux	173 57.1	−62 51.9
19	Adhara	255 46.5	−28 54.8
10	Aldebaran	291 38.7	+16 25.4
32	Alioth	166 58.0	+56 11.9
34	Alkaid	153 32.3	+49 32.0
55	Al Na'ir	28 37.0	−47 10.0
15	Alnilam	276 30.0	− 1 13.7
25	Alphard	218 38.3	− 8 28.3
41	Alphecca	126 46.9	+26 51.7
1	Alpheratz	358 27.7	+28 51.0
51	Altair	62 49.5	+ 8 45.2
2	Ankaa	353 57.8	−42 32.2
42	Antares	113 18.3	−26 20.3
37	Arcturus	146 34.5	+19 24.6
43	Atria	108 58.0	−68 57.1
22	Avior	234 36.1	−59 22.4
13	Bellatrix	279 18.1	+ 6 18.7
16	Betelg'se	271 47.9	+ 7 24.0
17	Canopus	264 15.7	−52 40.3
12	Capella	281 38.0	+45 57.3
53	Deneb	50 00.2	+45 07.4
28	Denebola	183 17.2	+14 48.9
4	Diphda	349 38.7	−18 13.3
27	Dubhe	194 44.2	+61 59.3
14	Elnath	279 07.0	+28 34.3
47	Eltanin	91 05.4	+51 29.7
54	Enif	34 28.8	+ 9 40.6
56	Fomalhaut	16 10.9	−29 50.9
31	Gacrux	172 48.5	−56 52.6
29	Gienah	176 36.3	−17 18.2
35	Hadar	149 48.3	−60 10.2
6	Hamal	328 49.1	+23 15.4
48	Kaus Aust.	84 40.0	−34 24.3
40	Kochab	137 17.3	+74 20.2
57	Markab	14 20.7	+14 58.3
8	Menkar	314 59.9	+ 3 55.2
36	Menkent	148 57.8	−36 09.6
24	Miapl'dus	221 49.5	−69 32.6
9	Mirfak	309 41.9	+49 42.3
50	Nunki	76 50.8	−26 21.0
52	Peacock	54 25.9	−56 52.3
21	Pollux	244 20.3	+28 07.9
20	Procyon	245 44.7	+ 5 20.2
46	R'alhague	96 45.7	+12 35.5
26	Regulus	208 29.1	+12 10.8
11	Rigel	281 53.4	− 8 15.0
38	Rigil Kent.	140 49.8	−60 39.7
44	Sabik	103 01.2	−15 40.3
3	Schedar	350 29.3	+56 17.8
45	Shaula	97 19.5	−37 04.4
18	Sirius	259 11.7	−16 39.4
33	Spica	159 16.2	−10 56.2
23	Suhail	223 24.2	−43 15.6
49	Vega	81 07.4	+38 44.6
39	Zub'g'bi	137 52.5	−15 51.8

GMT	Equation of Time (App. − Mean) 26	27	28
h	m s	m s	m s
0	− 2 36.4	− 2 48.9	− 3 01.2
6	− 2 39.5	− 2 52.0	− 3 04.3
12	− 2 42.6	− 2 55.1	− 3 07.3
18	− 2 45.8	− 2 58.1	− 3 10.4
24	− 2 48.9	− 3 01.2	− 3 13.4

Lat. N °	Sunrise h m	Twlt. begins h m
72	□	□
70	□	□
68	□	□
66	□	□
64	1 35	////
62	2 12	////
60	2 38	////
58	2 59	////
56	3 15	////
54	3 29	////
52	3 42	////
50	3 53	////
45	4 15	1 42
40	4 33	2 30
35	4 48	3 01
30	5 01	3 25
20	5 23	3 59
10	5 42	4 23
0	5 59	4 44
10	6 17	5 01
20	6 35	5 16
30	6 56	5 31
35	7 09	5 37
40	7 23	5 44
45	7 39	5 52
50	8 00	6 01
52	8 10	6 04
54	8 21	6 08
56	8 34	6 12
58	8 48	6 15
60	9 06	6 20
S		

Lat. N °	Moonrise 26 h m	27 h m	28 h m	29 h m
72	23 23	23 05	22 49	22 34
70	23 04	22 54	22 45	22 36
68	22 49	22 45	22 41	22 37
66	22 37	22 38	22 38	22 38
64	22 26	22 31	22 35	22 39
62	22 17	22 26	22 33	22 40
60	22 10	22 21	22 31	22 41
58	22 03	22 17	22 29	22 42
56	21 57	22 13	22 28	22 42
54	21 51	22 10	22 26	22 43
52	21 47	22 06	22 25	22 43
50	21 42	22 04	22 24	22 44
45	21 33	21 58	22 21	22 45
40	21 24	21 52	22 19	22 46
35	21 18	21 48	22 17	22 46
30	21 11	21 44	22 16	22 47
20	21 01	21 37	22 13	22 48
10	20 51	21 31	22 10	22 49
0	20 43	21 25	22 08	22 50
10	20 34	21 20	22 05	22 51
20	20 25	21 14	22 03	22 52
30	20 14	21 07	22 00	22 54
35	20 07	21 03	21 58	22 54
40	20 00	20 58	21 56	22 55
45	19 52	20 53	21 54	22 56
50	19 42	20 47	21 52	22 57
52	19 37	20 44	21 50	22 58
54	19 32	20 40	21 49	22 59
56	19 27	20 37	21 47	22 59
58	19 20	20 33	21 46	23 00
60	19 13	20 28	21 44	23 01

Lat. N °	Sunset h m	Twlt. ends h m
72	□	□
70	□	□
68	□	□
66	□	□
64	22 30	////
62	21 53	////
60	21 27	////
58	21 07	////
56	20 50	////
54	20 36	////
52	20 24	////
50	20 13	////
45	19 51	22 23
40	19 33	21 36
35	19 18	21 05
30	19 05	20 41
20	18 43	20 07
10	18 24	19 42
0	18 07	19 22
10	17 49	19 04
20	17 31	18 50
30	17 10	18 35
35	16 57	18 28
40	16 43	18 21
45	16 27	18 14
50	16 06	18 05
52	15 56	18 02
54	15 45	17 58
56	15 33	17 55
58	15 18	17 51
60	15 01	17 47

Lat. N °	Moonset 26 h m	27 h m	28 h m	29 h m
72	4 45	6 42	8 30	10 14
70	5 17	7 00	8 39	10 16
68	5 40	7 14	8 46	10 17
66	5 57	7 25	8 52	10 18
64	6 12	7 34	8 56	10 19
62	6 24	7 42	9 01	10 20
60	6 34	7 49	9 04	10 21
58	6 43	7 55	9 08	10 21
56	6 50	8 00	9 11	10 22
54	6 57	8 05	9 13	10 22
52	7 03	8 09	9 16	10 23
50	7 09	8 13	9 18	10 23
45	7 21	8 21	9 22	10 24
40	7 31	8 28	9 26	10 25
35	7 39	8 34	9 29	10 25
30	7 46	8 39	9 32	10 26
20	7 59	8 48	9 37	10 27
10	8 10	8 56	9 42	10 27
0	8 20	9 03	9 46	10 28
10	8 30	9 11	9 50	10 29
20	8 41	9 18	9 54	10 29
30	8 53	9 27	9 59	10 30
35	9 01	9 32	10 02	10 31
40	9 09	9 38	10 05	10 31
45	9 18	9 44	10 08	10 32
50	9 29	9 52	10 13	10 33
52	9 34	9 56	10 15	10 33
54	9 40	9 59	10 17	10 33
56	9 46	10 04	10 19	10 34
58	9 53	10 09	10 22	10 34
60	10 01	10 14	10 25	10 34

GMT of Transit
Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
26	2 10	11 34	4 41	15 43	21 21
27	2 53	11 28	4 39	15 40	21 17
28	3 36	11 21	4 37	15 37	21 13
29	4 18	11 15	4 35	15 34	21 09

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.1	0.5	0.2
30	0.1	0.4	0.2
45	0.1	0.3	0.1
60	0.1	0.2	0.1
75	0.1	0.1	0.0
90			

Moon's Lower Limb **Add**

Alt. °	26 ′	27 ′	28 ′
0	11.9	12.1	12.5
4	11.9	12.1	12.5
8	11.9	12.2	12.5
12	11.9	12.2	12.6
16	12.0	12.2	12.6
20	12.1	12.3	12.7
24	12.2	12.4	12.7
28	12.2	12.5	12.8
32	12.4	12.6	12.9
36	12.5	12.7	13.0
40	12.6	12.8	13.1
44	12.7	12.9	13.2
48	12.9	13.1	13.4
52	13.1	13.2	13.5
56	13.2	13.4	13.6
60	13.4	13.5	13.8
64	13.6	13.7	13.9
68	13.8	13.9	14.1
72	14.0	14.1	14.2
76	14.2	14.3	14.4
80	14.4	14.4	14.6
84	14.6	14.6	14.7
88	14.7	14.8	14.9
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt. °	26 ′	27 ′	28 ′
0	17.7	17.5	17.3
4	17.6	17.5	17.3
8	17.6	17.5	17.3
12	17.6	17.4	17.2
16	17.5	17.4	17.2
20	17.5	17.3	17.1
24	17.4	17.2	17.1
28	17.3	17.2	17.0
32	17.2	17.1	16.9
36	17.0	16.9	16.8
40	16.9	16.8	16.7
44	16.8	16.7	16.6
48	16.6	16.6	16.4
52	16.5	16.4	16.3
56	16.3	16.2	16.2
60	16.1	16.1	16.0
64	15.9	15.9	15.9
68	15.8	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.2
84	15.0	15.0	15.1
88	14.8	14.9	14.9
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.3 GHA	VENUS −3.3 Dec.	MARS −1.0 GHA	MARS −1.0 Dec.	JUPITER −1.4 GHA	JUPITER −1.4 Dec.	SATURN 0.5 GHA	SATURN 0.5 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
29 0	277 03.0	190 29.9	+19 51.7	291 13.0	−10 16.9	126 05.5	+12 56.5	41 52.5	−17 23.4	297 22.4	153	− 2 56.9	+113
1	292 05.4	205 33.8	51.2	306 14.4	16.6	141 07.6	56.4	56 55.1	23.3	311 56.7	154	2 45.6	+112
2	307 07.9	220 37.7	50.7	321 15.7	16.3	156 09.6	56.2	71 57.7	23.3	326 31.1	153	2 34.4	+113
3	322 10.4	235 41.6	·· 50.2	336 17.1	·· 16.0	171 11.7	·· 56.1	87 00.3	·· 23.3	341 05.4	153	· 2 23.1	+113
4	337 12.8	250 45.4	49.7	351 18.5	15.7	186 13.7	55.9	102 02.9	23.3	355 39.7	153	2 11.8	+113
5	352 15.3	265 49.3	49.2	6 19.9	15.4	201 15.8	55.8	117 05.5	23.3	10 14.0	152	2 00.5	+113
6	7 17.8	280 53.2	+19 48.8	21 21.3	−10 15.1	216 17.8	+12 55.6	132 08.1	−17 23.2	24 48.2	153	− 1 49.2	+114
7	22 20.2	295 57.0	48.3	36 22.7	14.7	231 19.9	55.5	147 10.6	23.2	39 22.5	152	1 37.8	+113
8	37 22.7	311 00.9	47.8	51 24.1	14.4	246 21.9	55.3	162 13.2	23.2	53 56.7	153	1 26.5	+114
9	52 25.1	326 04.8	·· 47.3	66 25.5	·· 14.1	261 24.0	·· 55.2	177 15.8	·· 23.2	68 31.0	152	· 1 15.1	+114
10	67 27.6	341 08.6	46.8	81 26.9	13.8	276 26.1	55.0	192 18.4	23.2	83 05.2	152	1 03.7	+114
11	82 30.1	356 12.5	46.3	96 28.2	13.5	291 28.1	54.9	207 21.0	23.1	97 39.4	152	0 52.3	+114
12	97 32.5	11 16.3	+19 45.8	111 29.6	−10 13.2	306 30.2	+12 54.7	222 23.6	−17 23.1	112 13.6	151	− 0 40.9	+114
13	112 35.0	26 20.2	45.4	126 31.0	12.9	321 32.2	54.6	237 26.2	23.1	126 47.7	152	0 29.5	+114
14	127 37.5	41 24.0	44.9	141 32.4	12.6	336 34.3	54.4	252 28.8	23.1	141 21.9	151	0 18.1	+114
15	142 39.9	56 27.9	·· 44.4	156 33.8	·· 12.2	351 36.3	·· 54.3	267 31.3	·· 23.1	155 56.0	151	− 0 06.7	+115
16	157 42.4	71 31.7	43.9	171 35.2	11.9	6 38.4	54.1	282 33.9	23.1	170 30.1	150	+ 0 04.8	+114
17	172 44.9	86 35.5	43.4	186 36.6	11.6	21 40.4	54.0	297 36.5	23.0	185 04.1	151	0 16.2	+115
18	187 47.3	101 39.4	+19 43.0	201 38.0	−10 11.3	36 42.5	+12 53.8	312 39.1	−17 23.0	199 38.2	150	+ 0 27.7	+115
19	202 49.8	116 43.2	42.5	216 39.4	11.0	51 44.5	53.7	327 41.7	23.0	214 12.2	150	0 39.2	+114
20	217 52.3	131 47.0	42.0	231 40.8	10.7	66 46.6	53.5	342 44.3	23.0	228 46.2	150	0 50.6	+115
21	232 54.7	146 50.8	·· 41.5	246 42.2	·· 10.4	81 48.6	·· 53.4	357 46.8	·· 23.0	243 20.2	149	· 1 02.1	+115
22	247 57.2	161 54.7	41.1	261 43.6	10.1	96 50.7	53.2	12 49.4	22.9	257 54.1	150	1 13.6	+115
23	262 59.6	176 58.5	40.6	276 45.0	09.8	111 52.7	53.1	27 52.0	22.9	272 28.1	148	1 25.1	+115
30 0	278 02.1	192 02.3	+19 40.1	291 46.4	−10 09.5	126 54.8	+12 52.9	42 54.6	−17 22.9	287 01.9	149	+ 1 36.6	+115
1	293 04.6	207 06.1	39.6	306 47.8	09.1	141 56.8	52.8	57 57.2	22.9	301 35.8	148	1 48.1	+115
2	308 07.0	222 09.9	39.2	321 49.2	08.8	156 58.9	52.6	72 59.8	22.9	316 09.6	148	1 59.6	+115
3	323 09.5	237 13.7	·· 38.7	336 50.6	·· 08.5	172 01.0	·· 52.5	88 02.3	·· 22.9	330 43.4	148	· 2 11.1	+115
4	338 12.0	252 17.5	38.2	351 52.0	08.2	187 03.0	52.3	103 04.9	22.8	345 17.2	147	2 22.6	+115
5	353 14.4	267 21.3	37.8	6 53.4	07.9	202 05.1	52.2	118 07.5	22.8	359 50.9	147	2 34.1	+115
6	8 16.9	282 25.1	+19 37.3	21 54.8	−10 07.6	217 07.1	+12 52.0	133 10.1	−17 22.8	14 24.6	147	+ 2 45.6	+115
7	23 19.4	297 28.9	36.8	36 56.2	07.3	232 09.2	51.8	148 12.7	22.8	28 58.3	146	2 57.1	+115
8	38 21.8	312 32.7	36.4	51 57.6	07.0	247 11.2	51.7	163 15.3	22.8	43 31.9	146	3 08.6	+115
9	53 24.3	327 36.5	·· 35.9	66 59.0	·· 06.7	262 13.3	·· 51.5	178 17.8	·· 22.7	58 05.5	145	· 3 20.1	+115
10	68 26.8	342 40.2	35.4	82 00.4	06.4	277 15.3	51.4	193 20.4	22.7	72 39.0	145	3 31.6	+115
11	83 29.2	357 44.0	35.0	97 01.8	06.1	292 17.4	51.2	208 23.0	22.7	87 12.5	145	3 43.1	+115
12	98 31.7	12 47.8	+19 34.5	112 03.2	−10 05.8	307 19.4	+12 51.1	223 25.6	−17 22.7	101 46.0	144	+ 3 54.6	+115
13	113 34.1	27 51.6	34.0	127 04.6	05.5	322 21.5	50.9	238 28.2	22.7	116 19.4	144	4 06.1	+115
14	128 36.6	42 55.3	33.6	142 06.0	05.2	337 23.5	50.8	253 30.8	22.7	130 52.8	143	4 17.6	+114
15	143 39.1	57 59.1	·· 33.1	157 07.4	·· 04.8	352 25.6	·· 50.6	268 33.3	·· 22.6	145 26.1	143	· 4 29.0	+115
16	158 41.5	73 02.8	32.7	172 08.9	04.5	7 27.6	50.5	283 35.9	22.6	159 59.4	142	4 40.5	+114
17	173 44.0	88 06.6	32.2	187 10.3	04.2	22 29.7	50.3	298 38.5	22.6	174 32.6	142	4 51.9	+115
18	188 46.5	103 10.4	+19 31.7	202 11.7	−10 03.9	37 31.7	+12 50.2	313 41.1	−17 22.6	189 05.8	142	+ 5 03.4	+114
19	203 48.9	118 14.1	31.3	217 13.1	03.6	52 33.8	50.0	328 43.7	22.6	203 39.0	141	5 14.8	+114
20	218 51.4	133 17.8	30.8	232 14.5	03.3	67 35.8	49.9	343 46.3	22.6	218 12.1	140	5 26.2	+115
21	233 53.9	148 21.6	·· 30.4	247 15.9	·· 03.0	82 37.9	·· 49.7	358 48.8	·· 22.5	232 45.1	140	· 5 37.7	+114
22	248 56.3	163 25.3	29.9	262 17.3	02.7	97 39.9	49.6	13 51.4	22.5	247 18.1	140	5 49.1	+113
23	263 58.8	178 29.1	29.5	277 18.7	02.4	112 42.0	49.4	28 54.0	22.5	261 51.1	139	6 00.4	+114
1 0	279 01.3	193 32.8	+19 29.0	292 20.2	−10 02.1	127 44.0	+12 49.2	43 56.6	−17 22.5	276 24.0	138	+ 6 11.8	+114
1	294 03.7	208 36.5	28.6	307 21.6	01.8	142 46.1	49.1	58 59.2	22.5	290 56.8	138	6 23.2	+113
2	309 06.2	223 40.3	28.1	322 23.0	01.5	157 48.1	48.9	74 01.7	22.5	305 29.6	137	6 34.5	+113
3	324 08.6	238 44.0	·· 27.7	337 24.4	·· 01.2	172 50.2	·· 48.8	89 04.3	·· 22.4	320 02.3	137	· 6 45.8	+114
4	339 11.1	253 47.7	27.2	352 25.8	00.9	187 52.2	48.6	104 06.9	22.4	334 35.0	136	6 57.2	+112
5	354 13.6	268 51.4	26.8	7 27.2	00.6	202 54.3	48.5	119 09.5	22.4	349 07.6	135	7 08.4	+113
6	9 16.0	283 55.1	+19 26.3	22 28.7	−10 00.3	217 56.3	+12 48.3	134 12.1	−17 22.4	3 40.1	135	+ 7 19.7	+113
7	24 18.5	298 58.8	25.9	37 30.1	10 00.0	232 58.4	48.2	149 14.6	22.4	18 12.6	135	7 31.0	+112
8	39 21.0	314 02.5	25.4	52 31.5	9 59.7	248 00.4	48.0	164 17.2	22.4	32 45.1	134	7 42.2	+112
9	54 23.4	329 06.2	·· 25.0	67 32.9	·· 59.4	263 02.4	·· 47.9	179 19.8	·· 22.3	47 17.5	133	· 7 53.4	+112
10	69 25.9	344 09.9	24.5	82 34.3	59.1	278 04.5	47.7	194 22.4	22.3	61 49.8	132	8 04.6	+111
11	84 28.4	359 13.6	24.1	97 35.8	58.8	293 06.5	47.6	209 25.0	22.3	76 22.0	132	8 15.7	+112
12	99 30.8	14 17.3	+19 23.6	112 37.2	− 9 58.5	308 08.6	+12 47.4	224 27.5	−17 22.3	90 54.2	131	+ 8 26.9	+111
13	114 33.3	29 21.0	23.2	127 38.6	58.2	323 10.6	47.2	239 30.1	22.3	105 26.3	131	8 38.0	+111
14	129 35.7	44 24.7	22.8	142 40.0	57.9	338 12.7	47.1	254 32.7	22.2	119 58.4	130	8 49.1	+110
15	144 38.2	59 28.4	·· 22.3	157 41.5	·· 57.6	353 14.7	·· 46.9	269 35.3	·· 22.2	134 30.4	129	· 9 00.1	+111
16	159 40.7	74 32.0	21.9	172 42.9	57.3	8 16.8	46.8	284 37.8	22.2	149 02.3	128	9 11.2	+110
17	174 43.1	89 35.7	21.5	187 44.3	57.0	23 18.8	46.6	299 40.4	22.2	163 34.1	128	9 22.2	+109
18	189 45.6	104 39.4	+19 21.0	202 45.7	− 9 56.7	38 20.9	+12 46.5	314 43.0	−17 22.2	178 05.9	127	+ 9 33.1	+110
19	204 48.1	119 43.1	20.6	217 47.2	56.4	53 22.9	46.3	329 45.6	22.2	192 37.6	126	9 44.1	+109
20	219 50.5	134 46.7	20.2	232 48.6	56.1	68 25.0	46.2	344 48.2	22.1	207 09.2	126	9 55.0	+108
21	234 53.0	149 50.4	·· 19.7	247 50.0	·· 55.8	83 27.0	·· 46.0	359 50.7	·· 22.1	221 40.8	125	·10 05.8	+109
22	249 55.5	164 54.0	19.3	262 51.5	55.5	98 29.1	45.8	14 53.3	22.1	236 12.3	124	10 16.7	+108
23	264 57.9	179 57.7	18.9	277 52.9	55.2	113 31.1	45.7	29 55.9	22.1	250 43.7	123	10 27.5	+107
24	280 00.4	195 01.3	+19 18.4	292 54.3	− 9 54.9	128 33.2	+12 45.5	44 58.5	−17 22.1	265 15.0	123	+10 38.2	+108
code	—	+ 38	− 5	+ 14	+ 3	+ 21	− 2	+ 26	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
29 0	179 11.6	+23 14.8
1	194 11.5	14.7
2	209 11.3	14.6
3	224 11.2	14.5
4	239 11.1	14.3
5	254 11.0	14.2
6	269 10.8	+23 14.1
7	284 10.7	13.9
8	299 10.6	13.8
9	314 10.5	13.7
10	329 10.3	13.5
11	344 10.2	13.4
12	359 10.1	+23 13.2
13	14 10.0	13.1
14	29 09.8	13.0
15	44 09.7	12.8
16	59 09.6	12.7
17	74 09.5	12.5
18	89 09.3	+23 12.4
19	104 09.2	12.3
20	119 09.1	12.1
21	134 09.0	12.0
22	149 08.8	11.8
23	164 08.7	11.7
30 0	179 08.6	+23 11.5
1	194 08.5	11.4
2	209 08.3	11.2
3	224 08.2	11.1
4	239 08.1	10.9
5	254 08.0	10.8
6	269 07.9	+23 10.6
7	284 07.7	10.5
8	299 07.6	10.3
9	314 07.5	10.2
10	329 07.4	10.0
11	344 07.2	09.9
12	359 07.1	+23 09.7
13	14 07.0	09.6
14	29 06.9	09.4
15	44 06.7	09.3
16	59 06.6	09.1
17	74 06.5	08.9
18	89 06.4	+23 08.8
19	104 06.3	08.6
20	119 06.1	08.5
21	134 06.0	08.3
22	149 05.9	08.1
23	164 05.8	08.0
1 0	179 05.7	+23 07.8
1	194 05.5	07.6
2	209 05.4	07.5
3	224 05.3	07.3
4	239 05.2	07.2
5	254 05.0	07.0
6	269 04.9	+23 06.8
7	284 04.8	06.7
8	299 04.7	06.5
9	314 04.6	06.3
10	329 04.4	06.1
11	344 04.3	06.0
12	359 04.2	+23 05.8
13	14 04.1	05.6
14	29 04.0	05.5
15	44 03.8	05.3
16	59 03.7	05.1
17	74 03.6	04.9
18	89 03.5	+23 04.8
19	104 03.4	04.6
20	119 03.2	04.4
21	134 03.1	04.2
22	149 03.0	04.0
23	164 02.9	03.9
24	179 02.8	+23 03.7
code	—	− 1

No.	Name	STARS SHA	STARS Dec.
		° ′	° ′
7	Acamar	315 51.0	−40 28.5
5	Achernar	335 58.6	−57 27.1
30	Acrux	173 57.1	−62 51.9
19	Adhara	255 46.5	−28 54.8
10	Aldebaran	291 38.7	+16 25.4
32	Alioth	166 58.0	+56 11.9
34	Alkaid	153 32.3	+49 32.0
55	Al Na'ir	28 36.9	−47 10.0
15	Alnilam	276 30.0	− 1 13.7
25	Alphard	218 38.3	− 8 28.3
41	Alphecca	126 46.9	+26 51.7
1	Alpheratz	358 27.7	+28 51.0
51	Altair	62 49.5	+ 8 45.2
2	Ankaa	353 57.7	−42 32.2
42	Antares	113 18.3	−26 20.3
37	Arcturus	146 34.5	+19 24.6
43	Atria	108 58.0	−68 57.2
22	Avior	234 36.1	−59 22.4
13	Bellatrix	279 18.1	+ 6 18.7
16	Betelg'se	271 47.8	+ 7 24.0
17	Canopus	264 15.7	−52 40.3
12	Capella	281 38.0	+45 57.2
53	Deneb	50 00.2	+45 07.5
28	Denebola	183 17.2	+14 48.9
4	Diphda	349 38.7	−18 13.3
27	Dubhe	194 44.2	+61 59.3
14	Elnath	279 07.0	+28 34.3
47	Eltanin	91 05.4	+51 29.7
54	Enif	34 28.8	+ 9 40.6
56	Fomalhaut	16 10.8	−29 50.9
31	Gacrux	172 48.5	−56 52.6
29	Gienah	176 36.3	−17 18.2
35	Hadar	149 48.3	−60 10.2
6	Hamal	328 49.1	+23 15.4
48	Kaus Aust.	84 40.0	−34 24.3
40	Kochab	137 17.4	+74 20.2
57	Markab	14 20.7	+14 58.3
8	Menkar	314 59.9	+ 3 55.2
36	Menkent	148 57.8	−36 09.6
24	Miapl'dus	221 49.6	−69 32.6
9	Mirfak	309 41.9	+49 42.3
50	Nunki	76 50.8	−26 21.0
52	Peacock	54 25.8	−56 52.3
21	Pollux	244 20.2	+28 07.9
20	Procyon	245 44.7	+ 5 20.2
46	R'alhague	96 45.7	+12 35.5
26	Regulus	208 29.1	+12 10.8
11	Rigel	281 53.4	− 8 15.0
38	Rigil Kent.	140 49.8	−60 39.7
44	Sabik	103 01.2	−15 40.3
3	Schedar	350 29.3	+56 17.8
45	Shaula	97 19.5	−37 04.4
18	Sirius	259 11.7	−16 39.4
33	Spica	159 16.2	−10 56.2
23	Suhail	223 24.2	−43 15.6
49	Vega	81 07.4	+38 44.6
39	Zub'g'bi	137 52.5	−15 51.8

GMT	Equation of Time (App.—Mean) 29	30	1
h	m s	m s	m s
0	− 3 13.4	− 3 25.4	− 3 37.2
6	− 3 16.4	− 3 28.3	− 3 40.1
12	− 3 19.4	− 3 31.3	− 3 43.0
18	− 3 22.4	− 3 34.2	− 3 45.8
24	− 3 25.4	− 3 37.2	− 3 48.7

Lat. N °	Sunrise h m	Twlt. begins h m	Moonrise 29 h m	30 h m	1 h m	2 h m
72	□	□	22 34	22 19	22 01	21 37
70	□	□	22 36	22 27	22 17	22 05
68	□	□	22 37	22 33	22 30	22 27
66	□	□	22 38	22 39	22 40	22 43
64	1 39	////	22 39	22 44	22 49	22 57
62	2 15	////	22 40	22 48	22 57	23 09
60	2 41	////	22 41	22 51	23 04	23 19
58	3 01	////	22 42	22 55	23 10	23 28
56	3 17	////	22 42	22 57	23 15	23 36
54	3 31	////	22 43	23 00	23 19	23 42
52	3 44	////	22 43	23 02	23 24	23 49
50	3 54	////	22 44	23 05	23 28	23 54
45	4 16	1 45	22 45	23 09	23 36	24 07
40	4 34	2 32	22 46	23 13	23 43	24 17
35	4 49	3 02	22 46	23 17	23 49	24 25
30	5 02	3 26	22 47	23 20	23 55	24 33
20	5 24	3 59	22 48	23 25	24 04	0 04
10	5 43	4 24	22 49	23 30	24 12	0 12
0	6 00	4 45	22 50	23 34	24 20	0 20
10	6 17	5 02	22 51	23 39	24 28	0 28
20	6 35	5 16	22 52	23 43	24 37	0 37
30	6 56	5 31	22 54	23 49	24 46	0 46
35	7 09	5 38	22 54	23 52	24 52	0 52
40	7 23	5 44	22 55	23 56	24 58	0 58
45	7 39	5 52	22 56	24 00	0 00	1 06
50	8 00	6 01	22 57	24 05	0 05	1 15
52	8 09	6 04	22 58	24 07	0 07	1 19
54	8 20	6 08	22 59	24 10	0 10	1 24
56	8 33	6 11	22 59	24 13	0 13	1 29
58	8 47	6 16	23 00	24 16	0 16	1 35
60	9 04	6 20	23 01	24 20	0 20	1 42
S						

Lat. N °	Sunset h m	Twlt. ends h m	Moonset 29 h m	30 h m	1 h m	2 h m
72	□	□	10 14	12 00	13 52	15 56
70	□	□	10 16	11 55	13 38	15 30
68	□	□	10 17	11 50	13 27	15 10
66	23 50	////	10 18	11 46	13 18	14 54
64	22 27	////	10 19	11 43	13 10	14 41
62	21 51	////	10 20	11 41	13 04	14 30
60	21 26	////	10 21	11 38	12 58	14 21
58	21 06	////	10 21	11 36	12 53	14 13
56	20 49	////	10 22	11 34	12 49	14 06
54	20 35	////	10 22	11 32	12 45	14 00
52	20 23	////	10 23	11 31	12 41	13 54
50	20 13	////	10 23	11 30	12 38	13 49
45	19 51	22 22	10 24	11 27	12 31	13 38
40	19 33	21 35	10 25	11 24	12 25	13 29
35	19 18	21 04	10 25	11 22	12 20	13 22
30	19 05	20 41	10 26	11 20	12 16	13 15
20	18 43	20 07	10 27	11 17	12 09	13 03
10	18 25	19 43	10 27	11 14	12 02	12 53
0	18 07	19 22	10 28	11 11	11 56	12 43
10	17 50	19 05	10 29	11 08	11 50	12 34
20	17 32	18 51	10 29	11 05	11 43	12 24
30	17 11	18 36	10 30	11 02	11 36	12 12
35	16 59	18 30	10 31	11 00	11 31	12 05
40	16 45	18 22	10 31	10 58	11 26	11 58
45	16 28	18 14	10 32	10 56	11 21	11 49
50	16 08	18 07	10 33	10 53	11 14	11 39
52	15 58	18 03	10 33	10 51	11 11	11 34
54	15 47	18 00	10 33	10 50	11 08	11 28
56	15 35	17 57	10 34	10 48	11 04	11 23
58	15 20	17 52	10 34	10 46	11 00	11 16
60	15 03	17 48	10 34	10 44	10 55	11 08
S						

GMT of Transit
Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
29	4 18	11 15	4 35	15 34	21 09
30	5 01	11 09	4 33	15 30	21 05
1	5 45	11 03	4 30	15 27	21 01
2	6 32	10 57	4 28	15 24	20 57

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.1	0.5	0.2
30	0.1	0.4	0.2
45	0.1	0.3	0.1
60	0.1	0.2	0.1
75	0.1	0.1	0.0
90			

Moon's Lower Limb **Add**

Alt.	29	30	1
°	′	′	′
0	13.0	13.8	14.8
4	13.0	13.8	14.8
8	13.0	13.8	14.8
12	13.1	13.8	14.8
16	13.1	13.8	14.8
20	13.2	13.9	14.8
24	13.2	13.9	14.8
28	13.3	14.0	14.9
32	13.3	14.0	14.9
36	13.4	14.1	14.9
40	13.5	14.1	14.9
44	13.6	14.2	15.0
48	13.7	14.3	15.0
52	13.8	14.3	15.0
56	13.9	14.4	15.1
60	14.1	14.5	15.1
64	14.2	14.6	15.1
68	14.3	14.7	15.2
72	14.5	14.8	15.2
76	14.6	14.9	15.3
80	14.7	15.0	15.3
84	14.9	15.1	15.3
88	15.0	15.1	15.4
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	29	30	1
°	′	′	′
0	17.0	16.6	16.0
4	17.0	16.6	16.0
8	17.0	16.5	16.0
12	16.9	16.5	16.0
16	16.9	16.5	16.0
20	16.9	16.5	15.9
24	16.8	16.4	15.9
28	16.7	16.4	15.9
32	16.7	16.3	15.9
36	16.6	16.3	15.9
40	16.5	16.2	15.8
44	16.4	16.1	15.8
48	16.3	16.1	15.8
52	16.2	16.0	15.7
56	16.1	15.9	15.7
60	15.9	15.8	15.7
64	15.8	15.7	15.6
68	15.7	15.6	15.6
72	15.6	15.6	15.6
76	15.4	15.5	15.5
80	15.3	15.4	15.5
84	15.1	15.3	15.4
88	15.0	15.2	15.4
90			

Subtract from table, back cover

Last Quarter 1

GMT	♈ GHA	VENUS −3.6 GHA	Dec	MARS −1.0 GHA	Dec	JUPITER −1.4 GHA	Dec	SATURN 0.5 GHA	Dec	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
2 0	280 00.4	195 01.3	+19 18.4	292 54.3	− 9 54.9	128 33.2	+12 45.5	44 58.5	−17 22.1	265 15.0	123	+10 38.2	+108
1	295 02.9	210 05.0	18.0	307 55.7	54.6	143 35.2	45.4	60 01.0	22.1	279 46.3	122	10 49.0	+107
2	310 05.3	225 08.6	17.6	322 57.2	54.3	158 37.2	45.2	75 03.6	22.1	294 17.5	121	10 59.7	+106
3	325 07.8	240 12.2	·· 17.1	337 58.6	·· 54.0	173 39.3	·· 45.1	90 06.2	·· 22.0	308 48.6	120	·11 10.3	+106
4	340 10.2	255 15.9	16.7	353 00.0	53.7	188 41.3	44.9	105 08.8	22.0	323 19.6	120	11 20.9	+106
5	355 12.7	270 19.5	16.3	8 01.5	53.4	203 43.4	44.8	120 11.4	22.0	337 50.6	118	11 31.5	+105
6	10 15.2	285 23.1	+19 15.9	23 02.9	− 9 53.1	218 45.4	+12 44.6	135 13.9	−17 22.0	352 21.4	118	+11 42.0	+105
7	25 17.6	300 26.8	15.4	38 04.4	52.8	233 47.5	44.5	150 16.5	22.0	6 52.2	117	11 52.5	+104
8	40 20.1	315 30.4	15.0	53 05.8	52.5	248 49.5	44.3	165 19.1	22.0	21 22.9	116	12 02.9	+104
9	55 22.6	330 34.0	·· 14.6	68 07.2	·· 52.3	263 51.6	·· 44.1	180 21.7	·· 21.9	35 53.5	116	·12 13.3	+104
10	70 25.0	345 37.6	14.2	83 08.7	52.0	278 53.6	44.0	195 24.2	21.9	50 24.1	114	12 23.7	+103
11	85 27.5	0 41.2	13.8	98 10.1	51.7	293 55.6	43.8	210 26.8	21.9	64 54.5	114	12 34.0	+102
12	100 30.0	15 44.8	+19 13.3	113 11.5	− 9 51.4	308 57.7	+12 43.7	225 29.4	−17 21.9	79 24.9	113	+12 44.2	+102
13	115 32.4	30 48.4	12.9	128 13.0	51.1	323 59.7	43.5	240 32.0	21.9	93 55.2	111	12 54.4	+101
14	130 34.9	45 52.0	12.5	143 14.4	50.8	339 01.8	43.4	255 34.5	21.9	108 25.3	111	13 04.5	+101
15	145 37.4	60 55.6	·· 12.1	158 15.9	·· 50.5	354 03.8	·· 43.2	270 37.1	·· 21.8	122 55.4	111	·13 14.6	+101
16	160 39.8	75 59.2	11.7	173 17.3	50.2	9 05.9	43.1	285 39.7	21.8	137 25.5	109	13 24.7	+ 99
17	175 42.3	91 02.8	11.3	188 18.7	49.9	24 07.9	42.9	300 42.3	21.8	151 55.4	108	13 34.6	+100
18	190 44.7	106 06.3	+19 10.8	203 20.2	− 9 49.6	39 10.0	+12 42.7	315 44.8	−17 21.8	166 25.2	107	+13 44.6	+ 98
19	205 47.2	121 09.9	10.4	218 21.6	49.3	54 12.0	42.6	330 47.4	21.8	180 54.9	107	13 54.4	+ 98
20	220 49.7	136 13.5	10.0	233 23.1	49.0	69 14.0	42.4	345 50.0	21.8	195 24.6	105	14 04.2	+ 98
21	235 52.1	151 17.1	·· 09.6	248 24.5	·· 48.7	84 16.1	·· 42.3	0 52.6	·· 21.7	209 54.1	105	·14 14.0	+ 97
22	250 54.6	166 20.6	09.2	263 26.0	48.5	99 18.1	42.1	15 55.1	21.7	224 23.6	104	14 23.7	+ 96
23	265 57.1	181 24.2	08.8	278 27.4	48.2	114 20.2	42.0	30 57.7	21.7	238 53.0	103	14 33.3	+ 95
3 0	280 59.5	196 27.7	+19 08.4	293 28.9	− 9 47.9	129 22.2	+12 41.8	46 00.3	−17 21.7	253 22.3	101	+14 42.8	+ 95
1	296 02.0	211 31.3	08.0	308 30.3	47.6	144 24.3	41.6	61 02.9	21.7	267 51.4	101	14 52.3	+ 94
2	311 04.5	226 34.8	07.6	323 31.8	47.3	159 26.3	41.5	76 05.4	21.7	282 20.5	100	15 01.7	+ 94
3	326 06.9	241 38.4	·· 07.2	338 33.2	·· 47.0	174 28.3	·· 41.3	91 08.0	·· 21.7	296 49.5	99	·15 11.1	+ 93
4	341 09.4	256 41.9	06.8	353 34.7	46.7	189 30.4	41.2	106 10.6	21.6	311 18.4	98	15 20.4	+ 92
5	356 11.9	271 45.5	06.4	8 36.1	46.4	204 32.4	41.0	121 13.2	21.6	325 47.2	97	15 29.6	+ 91
6	11 14.3	286 49.0	+19 06.0	23 37.6	− 9 46.1	219 34.5	+12 40.9	136 15.7	−17 21.6	340 15.9	96	+15 38.7	+ 91
7	26 16.8	301 52.5	05.6	38 39.0	45.8	234 36.5	40.7	151 18.3	21.6	354 44.5	95	15 47.8	+ 90
8	41 19.2	316 56.1	05.2	53 40.5	45.6	249 38.6	40.5	166 20.9	21.6	9 13.0	94	15 56.8	+ 89
9	56 21.7	331 59.6	·· 04.8	68 41.9	·· 45.3	264 40.6	·· 40.4	181 23.5	·· 21.6	23 41.4	93	·16 05.7	+ 89
10	71 24.2	347 03.1	04.4	83 43.4	45.0	279 42.6	40.2	196 26.0	21.5	38 09.7	92	16 14.6	+ 87
11	86 26.6	2 06.6	04.0	98 44.8	44.7	294 44.7	40.1	211 28.6	21.5	52 37.9	91	16 23.3	+ 87
12	101 29.1	17 10.1	+19 03.6	113 46.3	− 9 44.4	309 46.7	+12 39.9	226 31.2	−17 21.5	67 06.0	90	+16 32.0	+ 86
13	116 31.6	32 13.6	03.2	128 47.7	44.1	324 48.8	39.8	241 33.7	21.5	81 34.0	89	16 40.6	+ 85
14	131 34.0	47 17.1	02.8	143 49.2	43.8	339 50.8	39.6	256 36.3	21.5	96 01.9	88	16 49.1	+ 85
15	146 36.5	62 20.6	·· 02.4	158 50.7	·· 43.5	354 52.8	·· 39.4	271 38.9	·· 21.5	110 29.7	87	·16 57.6	+ 83
16	161 39.0	77 24.1	02.0	173 52.1	43.3	9 54.9	39.3	286 41.5	21.5	124 57.4	86	17 05.9	+ 83
17	176 41.4	92 27.6	01.6	188 53.6	43.0	24 56.9	39.1	301 44.0	21.4	139 25.0	85	17 14.2	+ 81
18	191 43.9	107 31.1	+19 01.3	203 55.0	− 9 42.7	39 59.0	+12 39.0	316 46.6	−17 21.4	153 52.5	84	+17 22.3	+ 81
19	206 46.3	122 34.6	00.9	218 56.5	42.4	55 01.0	38.8	331 49.2	21.4	168 19.9	83	17 30.4	+ 80
20	221 48.8	137 38.0	00.5	233 58.0	42.1	70 03.1	38.7	346 51.7	21.4	182 47.2	82	17 38.4	+ 79
21	236 51.3	152 41.5	·19 00.1	248 59.4	·· 41.8	85 05.1	·· 38.5	1 54.3	·· 21.4	197 14.4	81	·17 46.3	+ 78
22	251 53.7	167 45.0	18 59.7	264 00.9	41.6	100 07.1	38.3	16 56.9	21.4	211 41.5	80	17 54.1	+ 77
23	266 56.2	182 48.5	59.3	279 02.4	41.3	115 09.2	38.2	31 59.5	21.4	226 08.5	79	18 01.8	+ 76
4 0	281 58.7	197 51.9	+18 58.9	294 03.8	− 9 41.0	130 11.2	+12 38.0	47 02.0	−17 21.3	240 35.4	78	+18 09.4	+ 75
1	297 01.1	212 55.4	58.6	309 05.3	40.7	145 13.3	37.9	62 04.6	21.3	255 02.2	76	18 16.9	+ 75
2	312 03.6	227 58.8	58.2	324 06.7	40.4	160 15.3	37.7	77 07.2	21.3	269 28.8	76	18 24.4	+ 73
3	327 06.1	243 02.3	·· 57.8	339 08.2	·· 40.1	175 17.3	·· 37.6	92 09.7	·· 21.3	283 55.4	75	·18 31.7	+ 72
4	342 08.5	258 05.7	57.4	354 09.7	39.9	190 19.4	37.4	107 12.3	21.3	298 21.9	74	18 38.9	+ 71
5	357 11.0	273 09.2	57.1	9 11.2	39.6	205 21.4	37.2	122 14.9	21.3	312 48.3	73	18 46.0	+ 70
6	12 13.5	288 12.6	+18 56.7	24 12.6	− 9 39.3	220 23.5	+12 37.1	137 17.4	−17 21.2	327 14.6	71	+18 53.0	+ 69
7	27 15.9	303 16.0	56.3	39 14.1	39.0	235 25.5	36.9	152 20.0	21.2	341 40.7	71	18 59.9	+ 68
8	42 18.4	318 19.5	55.9	54 15.6	38.7	250 27.5	36.8	167 22.6	21.2	356 06.8	70	19 06.7	+ 66
9	57 20.8	333 22.9	·· 55.6	69 17.0	·· 38.4	265 29.6	·· 36.6	182 25.2	·· 21.2	10 32.8	69	·19 13.3	+ 66
10	72 23.3	348 26.3	55.2	84 18.5	38.2	280 31.6	36.5	197 27.7	21.2	24 58.7	67	19 19.9	+ 64
11	87 25.8	3 29.7	54.8	99 20.0	37.9	295 33.6	36.3	212 30.3	21.2	39 24.4	67	19 26.3	+ 64
12	102 28.2	18 33.2	+18 54.4	114 21.5	− 9 37.6	310 35.7	+12 36.1	227 32.9	−17 21.2	53 50.1	66	+19 32.7	+ 62
13	117 30.7	33 36.6	54.1	129 22.9	37.3	325 37.7	36.0	242 35.4	21.1	68 15.7	65	19 38.9	+ 61
14	132 33.2	48 40.0	53.7	144 24.4	37.0	340 39.8	35.8	257 38.0	21.1	82 41.2	64	19 45.0	+ 60
15	147 35.6	63 43.4	·· 53.4	159 25.9	·· 36.8	355 41.8	·· 35.7	272 40.6	·· 21.1	97 06.6	63	·19 51.0	+ 58
16	162 38.1	78 46.8	53.0	174 27.4	36.5	10 43.8	35.5	287 43.1	21.1	111 31.9	62	19 56.8	+ 58
17	177 40.6	93 50.2	52.6	189 28.8	36.2	25 45.9	35.3	302 45.7	21.1	125 57.1	60	20 02.6	+ 56
18	192 43.0	108 53.6	+18 52.3	204 30.3	− 9 35.9	40 47.9	+12 35.2	317 48.3	−17 21.1	140 22.1	61	+20 08.2	+ 55
19	207 45.5	123 56.9	51.9	219 31.8	35.7	55 50.0	35.0	332 50.8	21.1	154 47.2	59	20 13.7	+ 54
20	222 48.0	139 00.3	51.5	234 33.3	35.4	70 52.0	34.9	347 53.4	21.0	169 12.1	58	20 19.1	+ 52
21	237 50.4	154 03.7	·· 51.2	249 34.7	·· 35.1	85 54.0	·· 34.7	2 56.0	·· 21.0	183 36.9	57	·20 24.3	+ 51
22	252 52.9	169 07.1	50.8	264 36.2	34.8	100 56.1	34.6	17 58.5	21.0	198 01.6	56	20 29.4	+ 50
23	267 55.3	184 10.4	50.5	279 37.7	34.5	115 58.1	34.4	33 01.1	21.0	212 26.2	56	20 34.4	+ 49
24	282 57.8	199 13.8	+18 50.1	294 39.2	− 9 34.3	131 00.1	+12 34.2	48 03.7	−17 21.0	226 50.8	54	+20 39.3	+ 47
code	−	+ 35	− 4	+ 14	+ 3	+ 21	− 1	+ 25	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
2 0	179 02.8	+23 03.7	7	Acamar	315 50.9	−40 28.4
1	194 02.7	03.5	5	Achernar	335 58.6	−57 27.1
2	209 02.5	03.3	30	Acrux	173 57.1	−62 51.9
3	224 02.4	·· 03.1	19	Adhara	255 46.5	−28 54.8
4	239 02.3	03.0	10	Aldebaran	291 38.7	+16 25.4
5	254 02.2	02.8				
6	269 02.1	+23 02.6	32	Alioth	166 58.1	+56 11.9
7	284 01.9	02.4	34	Alkaid	153 32.3	+49 32.0
8	299 01.8	02.2	55	Al Na'ir	28 36.9	−47 10.0
9	314 01.7	·· 02.0	15	Alnilam	276 30.0	− 1 13.7
10	329 01.6	01.8	25	Alphard	218 38.3	− 8 28.3
11	344 01.5	01.7				
12	359 01.3	+23 01.5	41	Alphecca	126 46.9	+26 51.7
13	14 01.2	01.3	1	Alpheratz	358 27.6	+28 51.0
14	29 01.1	01.1	51	Altair	62 49.5	+ 8 45.3
15	44 01.0	·· 00.9	2	Ankaa	353 57.7	−42 32.2
16	59 00.9	00.7	42	Antares	113 18.3	−26 20.3
17	74 00.8	00.5				
18	89 00.6	+23 00.3	37	Arcturus	146 34.5	+19 24.6
19	104 00.5	23 00.1	43	Atria	108 58.0	−68 57.2
20	119 00.4	22 59.9	22	Avior	234 36.1	−59 22.4
21	134 00.3	·· 59.7	13	Bellatrix	279 18.1	+ 6 18.7
22	149 00.2	59.6	16	Betelg'se	271 47.8	+ 7 24.0
23	164 00.1	59.4				
				Canopus	264 15.7	−52 40.3
3 0	178 59.9	+22 59.2	12	Capella	281 38.0	+45 57.2
1	193 59.8	59.0	53	Deneb	50 00.1	+45 07.5
2	208 59.7	58.8	28	Denebola	183 17.2	+14 48.9
3	223 59.6	·· 58.6	4	Diphda	349 38.7	−18 13.3
4	238 59.5	58.4				
5	253 59.4	58.2	27	Dubhe	194 44.2	+61 59.3
6	268 59.2	+22 58.0	14	Elnath	279 07.0	+28 34.3
7	283 59.1	57.8	47	Eltanin	91 05.4	+51 29.7
8	298 59.0	57.6	54	Enif	34 28.8	+ 9 40.6
9	313 58.9	·· 57.4	56	Fomalhaut	16 10.8	−29 50.9
10	328 58.8	57.1				
11	343 58.7	56.9	31	Gacrux	172 48.6	−56 52.6
12	358 58.6	+22 56.7	29	Gienah	176 36.3	−17 18.2
13	13 58.4	56.5	35	Hadar	149 48.3	−60 10.2
14	28 58.3	56.3	6	Hamal	328 49.1	+23 15.4
15	43 58.2	·· 56.1	48	Kaus Aust.	84 40.0	−34 24.3
16	58 58.1	55.9				
17	73 58.0	55.7	40	Kochab	137 17.4	+74 20.3
18	88 57.9	+22 55.5	57	Markab	14 20.7	+14 58.3
19	103 57.8	55.3	8	Menkar	314 59.9	+ 3 55.3
20	118 57.6	55.1	36	Menkent	148 57.8	−36 09.6
21	133 57.5	·· 54.9	24	Miapl'dus	221 49.6	−69 32.6
22	148 57.4	54.7				
23	163 57.3	54.4	9	Mirfak	309 41.9	+49 42.3
			50	Nunki	76 50.8	−26 21.0
4 0	178 57.2	+22 54.2	52	Peacock	54 25.8	−56 52.3
1	193 57.1	54.0	21	Pollux	244 20.2	+28 07.9
2	208 57.0	53.8	20	Procyon	245 44.7	+ 5 20.2
3	223 56.8	·· 53.6				
4	238 56.7	53.4	46	R'alhague	96 45.7	+12 35.5
5	253 56.6	53.1	26	Regulus	208 29.1	+12 10.8
6	268 56.5	+22 52.9	11	Rigel	281 53.4	− 8 15.0
7	283 56.4	52.7	38	Rigil Kent.	140 49.8	−60 39.7
8	298 56.3	52.5	44	Sabik	103 01.2	−15 40.3
9	313 56.2	·· 52.3				
10	328 56.1	52.1	3	Schedar	350 29.2	+56 17.8
11	343 55.9	51.8	45	Shaula	97 19.5	−37 04.4
12	358 55.8	+22 51.6	18	Sirius	259 11.7	−16 39.4
13	13 55.7	51.4	33	Spica	159 16.2	−10 56.2
14	28 55.6	51.2	23	Suhail	223 24.2	−43 15.6
15	43 55.5	·· 50.9				
16	58 55.4	50.7	49	Vega	81 07.4	+38 44.6
17	73 55.3	50.5	39	Zub'g'bi	137 52.5	−15 51.8
18	88 55.2	+22 50.3				
19	103 55.1	50.0				
20	118 54.9	49.8				
21	133 54.8	·· 49.6				
22	148 54.7	49.4				
23	163 54.6	49.1				
24	178 54.5	+22 48.9				
code	—	− 2				

GMT	Equation of Time (App. − Mean) 2	3	4
h	m s	m s	m s
0	− 3 48.7	− 4 00.0	− 4 11.0
6	− 3 51.5	− 4 02.8	− 4 13.7
12	− 3 54.4	− 4 05.5	− 4 16.4
18	− 3 57.2	− 4 08.3	− 4 19.1
24	− 4 00.0	− 4 11.0	− 4 21.8

Lat. N °	Sunrise h m	Twlt. begins h m	Moonrise 2 h m	3 h m	4 h m	5 h m
72	□	□	21 37	20 41	□	□
70	□	□	22 05	21 47	□	□
68	□	□	22 27	22 23	22 22	22 27
66	0 34	////	22 43	22 50	23 03	23 36
64	1 45	////	22 57	23 10	23 32	24 12
62	2 19	////	23 09	23 27	23 54	24 38
60	2 44	////	23 19	23 40	24 12	0 12
58	3 04	////	23 28	23 52	24 27	0 27
56	3 20	////	23 36	24 03	0 03	0 39
54	3 34	////	23 42	24 12	0 12	0 51
52	3 46	////	23 49	24 20	0 20	1 00
50	3 56	////	23 54	24 27	0 27	1 09
45	4 18	1 47	24 07	0 07	0 43	1 28
40	4 36	2 33	24 17	0 17	0 56	1 43
35	4 50	3 04	24 25	0 25	1 07	1 56
30	5 03	3 27	24 33	0 33	1 17	2 08
20	5 25	4 00	0 04	0 47	1 34	2 27
10	5 43	4 26	0 12	0 58	1 49	2 44
0	6 00	4 45	0 20	1 09	2 03	3 00
10	6 18	5 02	0 28	1 21	2 17	3 17
20	6 36	5 17	0 37	1 33	2 32	3 34
30	6 56	5 31	0 46	1 46	2 49	3 54
35	7 09	5 37	0 52	1 54	2 59	4 05
40	7 22	5 46	0 58	2 04	3 11	4 19
45	7 39	5 53	1 06	2 14	3 25	4 35
50	7 59	6 00	1 15	2 28	3 41	4 55
52	8 08	6 04	1 19	2 34	3 50	5 04
54	8 19	6 07	1 24	2 41	3 58	5 14
56	8 31	6 11	1 29	2 48	4 08	5 26
58	8 46	6 14	1 35	2 57	4 20	5 40
60	9 02	6 18	1 42	3 07	4 33	5 56

Lat. N °	Sunset h m	Twlt. ends h m	Moonset 2 h m	3 h m	4 h m	5 h m
72	□	□	15 56	18 41	□	□
70	□	□	15 30	17 36	□	□
68	□	□	15 10	17 01	19 00	21 01
66	23 28	////	14 54	16 35	18 19	19 52
64	22 22	////	14 41	16 16	17 51	19 16
62	21 48	////	14 30	16 00	17 29	18 50
60	21 23	////	14 21	15 47	17 12	18 30
58	21 04	////	14 13	15 35	16 57	18 13
56	20 48	////	14 06	15 26	16 45	17 59
54	20 34	////	14 00	15 17	16 34	17 47
52	20 22	////	13 54	15 09	16 25	17 36
50	20 12	////	13 49	15 02	16 16	17 27
45	19 50	22 19	13 38	14 48	15 58	17 06
40	19 32	21 34	13 29	14 35	15 43	16 50
35	19 18	21 04	13 22	14 25	15 31	16 36
30	19 05	20 41	13 15	14 16	15 20	16 24
20	18 44	20 08	13 03	14 01	15 01	16 04
10	18 25	19 42	12 53	13 47	14 45	15 46
0	18 08	19 23	12 43	13 34	14 30	15 29
10	17 51	19 06	12 34	13 22	14 15	15 13
20	17 33	18 51	12 24	13 08	13 58	14 55
30	17 12	18 37	12 12	12 53	13 40	14 34
35	17 00	18 30	12 05	12 44	13 29	14 22
40	16 46	18 23	11 58	12 34	13 17	14 08
45	16 30	18 16	11 49	12 22	13 02	13 52
50	16 10	18 09	11 39	12 08	12 45	13 32
52	16 00	18 05	11 34	12 01	12 36	13 22
54	15 50	18 02	11 28	11 54	12 27	13 12
56	15 37	17 58	11 23	11 46	12 17	12 59
58	15 23	17 54	11 16	11 36	12 05	12 45
60	15 06	17 50	11 08	11 26	11 51	12 29

GMT of Transit
Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
2	6 32	10 57	4 28	15 24	20 57
3	7 22	10 52	4 26	15 20	20 52
4	8 16	10 46	4 23	15 17	20 48
5	9 15	10 41	4 21	15 14	20 44

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.1	0.5	0.2
30	0.1	0.4	0.2
45	0.1	0.3	0.1
60	0.1	0.2	0.1
75	0.1	0.1	0.0
90			

Moon's Lower Limb **Add**

Alt. °	2 ′	3 ′	4 ′
0	15.9	17.1	18.2
4	15.9	17.1	18.2
8	15.9	17.1	18.2
12	15.9	17.0	18.2
16	15.9	17.0	18.1
20	15.9	17.0	18.1
24	15.9	17.0	18.0
28	15.9	16.9	17.9
32	15.9	16.9	17.9
36	15.9	16.8	17.8
40	15.9	16.8	17.7
44	15.8	16.7	17.6
48	15.8	16.6	17.5
52	15.8	16.6	17.4
56	15.8	16.5	17.2
60	15.8	16.4	17.1
64	15.8	16.4	17.0
68	15.7	16.3	16.8
72	15.7	16.2	16.7
76	15.7	16.1	16.6
80	15.7	16.0	16.4
84	15.7	16.0	16.3
88	15.6	15.9	16.2
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt. °	2 ′	3 ′	4 ′
0	15.3	14.7	14.0
4	15.3	14.7	14.0
8	15.3	14.7	14.1
12	15.3	14.7	14.1
16	15.3	14.7	14.1
20	15.4	14.8	14.2
24	15.4	14.8	14.2
28	15.4	14.8	14.3
32	15.4	14.9	14.4
36	15.4	14.9	14.5
40	15.4	15.0	14.6
44	15.4	15.0	14.7
48	15.4	15.1	14.8
52	15.5	15.2	14.9
56	15.5	15.2	15.0
60	15.5	15.3	15.1
64	15.5	15.4	15.3
68	15.5	15.5	15.4
72	15.5	15.5	15.5
76	15.6	15.6	15.7
80	15.6	15.7	15.8
84	15.6	15.8	16.0
88	15.6	15.9	16.1
90			

Subtract from table, back cover

Independence Day 4

G M T	♈ GHA	VENUS −3.7 GHA	Dec.	MARS −1.1 GHA	Dec.	JUPITER −1.4 GHA	Dec.	SATURN 0.5 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
5 0	282 57.8	199 13.8	+18 50.1	294 39.2	− 9 34.3	131 00.1	+12 34.2	48 03.7	−17 21.0	226 50.8	54	+20 39.3 +	47
1	298 00.3	214 17.2	49.8	309 40.7	34.0	146 02.2	34.1	63 06.2	21.0	241 15.2	54	20 44.0 +	46
2	313 02.7	229 20.5	49.4	324 42.2	33.7	161 04.2	33.9	78 08.8	21.0	255 39.6	53	20 48.6 +	44
3	328 05.2	244 23.9	·· 49.0	339 43.6	·· 33.4	176 06.2	·· 33.8	93 11.4	·· 21.0	270 03.9	52	·20 53.0 +	44
4	343 07.7	259 27.2	48.7	354 45.1	33.2	191 08.3	33.6	108 14.0	20.9	284 28.1	51	20 57.4 +	41
5	358 10.1	274 30.6	48.3	9 46.6	32.9	206 10.3	33.4	123 16.5	20.9	298 52.2	50	21 01.5 +	41
6	13 12.6	289 33.9	+18 48.0	24 48.1	− 9 32.6	221 12.4	+12 33.3	138 19.1	−17 20.9	313 16.2	49	+21 05.6 +	39
7	28 15.1	304 37.2	47.6	39 49.6	32.3	236 14.4	33.1	153 21.6	20.9	327 40.1	49	21 09.5 +	38
8	43 17.5	319 40.6	47.3	54 51.1	32.1	251 16.4	33.0	168 24.2	20.9	342 04.0	48	21 13.3 +	36
9	58 20.0	334 43.9	·· 47.0	69 52.6	·· 31.8	266 18.5	·· 32.8	183 26.8	·· 20.9	356 27.8	47	·21 16.9 +	35
10	73 22.5	349 47.2	46.6	84 54.0	31.5	281 20.5	32.6	198 29.3	20.9	10 51.5	46	21 20.4 +	33
11	88 24.9	4 50.5	46.3	99 55.5	31.2	296 22.5	32.5	213 31.9	20.8	25 15.1	45	21 23.7 +	32
12	103 27.4	19 53.9	+18 45.9	114 57.0	− 9 31.0	311 24.6	+12 32.3	228 34.5	−17 20.8	39 38.6	45	+21 26.9 +	30
13	118 29.8	34 57.2	45.6	129 58.5	30.7	326 26.6	32.2	243 37.0	20.8	54 02.1	44	21 29.9 +	29
14	133 32.3	50 00.5	45.2	145 00.0	30.4	341 28.6	32.0	258 39.6	20.8	68 25.5	43	21 32.8 +	28
15	148 34.8	65 03.8	·· 44.9	160 01.5	·· 30.2	356 30.7	·· 31.8	273 42.2	·· 20.8	82 48.8	43	·21 35.6 +	26
16	163 37.2	80 07.1	44.6	175 03.0	29.9	11 32.7	31.7	288 44.7	20.8	97 12.1	42	21 38.2 +	24
17	178 39.7	95 10.4	44.2	190 04.5	29.6	26 34.7	31.5	303 47.3	20.8	111 35.3	41	21 40.6 +	23
18	193 42.2	110 13.7	+18 43.9	205 06.0	− 9 29.3	41 36.8	+12 31.4	318 49.9	−17 20.7	125 58.4	41	+21 42.9 +	22
19	208 44.6	125 16.9	43.6	220 07.5	29.1	56 38.8	31.2	333 52.4	20.7	140 21.5	39	21 45.1 +	20
20	223 47.1	140 20.2	43.2	235 09.0	28.8	71 40.9	31.0	348 55.0	20.7	154 44.4	40	21 47.1 +	18
21	238 49.6	155 23.5	·· 42.9	250 10.5	·· 28.5	86 42.9	·· 30.9	3 57.6	·· 20.7	169 07.4	39	·21 48.9 +	17
22	253 52.0	170 26.8	42.6	265 12.0	28.3	101 44.9	30.7	19 00.1	20.7	183 30.3	38	21 50.6 +	15
23	268 54.5	185 30.0	42.2	280 13.5	28.0	116 47.0	30.6	34 02.7	20.7	197 53.1	37	21 52.1 +	14
6 0	283 56.9	200 33.3	+18 41.9	295 15.0	− 9 27.7	131 49.0	+12 30.4	49 05.3	−17 20.7	212 15.8	37	+21 53.5 +	12
1	298 59.4	215 36.6	41.6	310 16.5	27.5	146 51.0	30.2	64 07.8	20.7	226 38.5	37	21 54.7 +	10
2	314 01.9	230 39.8	41.2	325 18.0	27.2	161 53.1	30.1	79 10.4	20.6	241 01.2	36	21 55.7 +	9
3	329 04.3	245 43.1	·· 40.9	340 19.5	·· 26.9	176 55.1	·· 29.9	94 12.9	·· 20.6	255 23.8	36	·21 56.6 +	8
4	344 06.8	260 46.3	40.6	355 21.0	26.6	191 57.1	29.8	109 15.5	20.6	269 46.4	35	21 57.4 +	6
5	359 09.3	275 49.6	40.3	10 22.5	26.4	206 59.2	29.6	124 18.1	20.6	284 08.9	34	21 58.0 +	4
6	14 11.7	290 52.8	+18 39.9	25 24.0	− 9 26.1	222 01.2	+12 29.4	139 20.6	−17 20.6	298 31.3	35	+21 58.4 +	2
7	29 14.2	305 56.0	39.6	40 25.5	25.8	237 03.2	29.3	154 23.2	20.6	312 53.8	33	21 58.6 +	1
8	44 16.7	320 59.3	39.3	55 27.0	25.6	252 05.3	29.1	169 25.8	20.6	327 16.1	34	21 58.7	0
9	59 19.1	336 02.5	·· 39.0	70 28.5	·· 25.3	267 07.3	·· 29.0	184 28.3	·· 20.6	341 38.5	33	·21 58.7 −	3
10	74 21.6	351 05.7	38.7	85 30.0	25.0	282 09.3	28.8	199 30.9	20.5	356 00.8	33	21 58.4 −	4
11	89 24.1	6 08.9	38.4	100 31.5	24.8	297 11.4	28.6	214 33.4	20.5	10 23.1	32	21 58.0 −	5
12	104 26.5	21 12.2	+18 38.0	115 33.0	− 9 24.5	312 13.4	+12 28.5	229 36.0	−17 20.5	24 45.3	33	+21 57.5 −	7
13	119 29.0	36 15.4	37.7	130 34.5	24.2	327 15.4	28.3	244 38.6	20.5	39 07.6	31	21 56.8 −	9
14	134 31.4	51 18.6	37.4	145 36.1	24.0	342 17.5	28.1	259 41.1	20.5	53 29.7	32	21 55.9 −	11
15	149 33.9	66 21.8	·· 37.1	160 37.6	·· 23.7	357 19.5	·· 28.0	274 43.7	·· 20.5	67 51.9	31	·21 54.8 −	12
16	164 36.4	81 25.0	36.8	175 39.1	23.5	12 21.5	27.8	289 46.2	20.5	82 14.0	32	21 53.6 −	14
17	179 38.8	96 28.2	36.5	190 40.6	23.2	27 23.6	27.7	304 48.8	20.5	96 36.2	31	21 52.2 −	15
18	194 41.3	111 31.4	+18 36.2	205 42.1	− 9 22.9	42 25.6	+12 27.5	319 51.4	−17 20.4	110 58.3	31	+21 50.7 −	17
19	209 43.8	126 34.5	35.9	220 43.6	22.7	57 27.6	27.3	334 53.9	20.4	125 20.4	30	21 49.0 −	19
20	224 46.2	141 37.7	35.6	235 45.1	22.4	72 29.6	27.2	349 56.5	20.4	139 42.4	31	21 47.1 −	20
21	239 48.7	156 40.9	·· 35.3	250 46.6	·· 22.1	87 31.7	·· 27.0	4 59.1	·· 20.4	154 04.5	30	·21 45.1 −	22
22	254 51.2	171 44.1	34.9	265 48.2	21.9	102 33.7	26.9	20 01.6	20.4	168 26.5	31	21 42.9 −	24
23	269 53.6	186 47.2	34.6	280 49.7	21.6	117 35.7	26.7	35 04.2	20.4	182 48.6	30	21 40.5 −	25
7 0	284 56.1	201 50.4	+18 34.3	295 51.2	− 9 21.3	132 37.8	+12 26.5	50 06.7	−17 20.4	197 10.6	30	+21 38.0 −	27
1	299 58.6	216 53.5	34.0	310 52.7	21.1	147 39.8	26.4	65 09.3	20.4	211 32.6	31	21 35.3 −	29
2	315 01.0	231 56.7	33.7	325 54.2	20.8	162 41.8	26.2	80 11.9	20.3	225 54.7	30	21 32.4 −	30
3	330 03.5	246 59.9	·· 33.4	340 55.8	·· 20.6	177 43.9	·· 26.1	95 14.4	·· 20.3	240 16.7	30	·21 29.4 −	32
4	345 05.9	262 03.0	33.1	355 57.3	20.3	192 45.9	25.9	110 17.0	20.3	254 38.7	31	21 26.2 −	33
5	0 08.4	277 06.1	32.8	10 58.8	20.0	207 47.9	25.7	125 19.5	20.3	269 00.8	30	21 22.9 −	35
6	15 10.9	292 09.3	+18 32.6	26 00.3	− 9 19.8	222 50.0	+12 25.6	140 22.1	−17 20.3	283 22.8	31	+21 19.4 −	37
7	30 13.3	307 12.4	32.3	41 01.8	19.5	237 52.0	25.4	155 24.7	20.3	297 44.9	31	21 15.7 −	38
8	45 15.8	322 15.5	32.0	56 03.4	19.3	252 54.0	25.2	170 27.2	20.3	312 07.0	31	21 11.9 −	40
9	60 18.3	337 18.7	·· 31.7	71 04.9	·· 19.0	267 56.1	·· 25.1	185 29.8	·· 20.3	326 29.1	31	·21 07.9 −	42
10	75 20.7	352 21.8	31.4	86 06.4	18.7	282 58.1	24.9	200 32.3	20.2	340 51.2	31	21 03.7 −	43
11	90 23.2	7 24.9	31.1	101 07.9	18.5	298 00.1	24.8	215 34.9	20.2	355 13.3	31	20 59.4 −	45
12	105 25.7	22 28.0	+18 30.8	116 09.5	− 9 18.2	313 02.1	+12 24.6	230 37.4	−17 20.2	9 35.4	32	+20 54.9 −	47
13	120 28.1	37 31.1	30.5	131 11.0	18.0	328 04.2	24.4	245 40.0	20.2	23 57.6	32	20 50.2 −	48
14	135 30.6	52 34.2	30.2	146 12.5	17.7	343 06.2	24.3	260 42.6	20.2	38 19.8	32	20 45.4 −	49
15	150 33.1	67 37.3	·· 29.9	161 14.1	·· 17.5	358 08.2	·· 24.1	275 45.1	·· 20.2	52 42.0	32	·20 40.5 −	51
16	165 35.5	82 40.4	29.7	176 15.6	17.2	13 10.3	23.9	290 47.7	20.2	67 04.2	33	20 35.4 −	53
17	180 38.0	97 43.5	29.4	191 17.1	16.9	28 12.3	23.8	305 50.2	20.2	81 26.5	33	20 30.1 −	54
18	195 40.4	112 46.6	+18 29.1	206 18.7	− 9 16.7	43 14.3	+12 23.6	320 52.8	−17 20.2	95 48.8	33	+20 24.7 −	56
19	210 42.9	127 49.7	28.8	221 20.2	16.4	58 16.3	23.5	335 55.4	20.1	110 11.1	34	20 19.1 −	57
20	225 45.4	142 52.8	28.5	236 21.7	16.2	73 18.4	23.3	350 57.9	20.1	124 33.5	34	20 13.4 −	59
21	240 47.8	157 55.8	·· 28.3	251 23.3	·· 15.9	88 20.4	·· 23.1	6 00.5	·· 20.1	138 55.9	35	·20 07.5 −	61
22	255 50.3	172 58.9	28.0	266 24.8	15.7	103 22.4	23.0	21 03.0	20.1	153 18.4	35	20 01.4 −	62
23	270 52.8	188 02.0	27.7	281 26.3	15.4	118 24.5	22.8	36 05.6	20.1	167 40.9	35	19 55.2 −	63
24	285 55.2	203 05.0	+18 27.4	296 27.9	− 9 15.2	133 26.5	+12 22.6	51 08.1	−17 20.1	182 03.4	36	+19 48.9 −	65
code	—	+ 32	− 3	+ 15	+ 3	+ 20	− 2	+ 26	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
5 00	178 54.5	+22 48.9
01	193 54.4	48.7
02	208 54.3	48.4
03	223 54.2	48.2
04	238 54.1	48.0
05	253 54.0	47.7
06	268 53.8	+22 47.5
07	283 53.7	47.3
08	298 53.6	47.0
09	313 53.5	46.8
10	328 53.4	46.6
11	343 53.3	46.3
12	358 53.2	+22 46.1
13	13 53.1	45.8
14	28 53.0	45.6
15	43 52.9	45.4
16	58 52.8	45.1
17	73 52.7	44.9
18	88 52.5	+22 44.6
19	103 52.4	44.4
20	118 52.3	44.1
21	133 52.2	43.9
22	148 52.1	43.7
23	163 52.0	43.4
6 00	178 51.9	+22 43.2
01	193 51.8	42.9
02	208 51.7	42.7
03	223 51.6	42.4
04	238 51.5	42.2
05	253 51.4	41.9
06	268 51.3	+22 41.7
07	283 51.2	41.4
08	298 51.1	41.2
09	313 51.0	40.9
10	328 50.8	40.7
11	343 50.7	40.4
12	358 50.6	+22 40.2
13	13 50.5	39.9
14	28 50.4	39.6
15	43 50.3	39.4
16	58 50.2	39.1
17	73 50.1	38.9
18	88 50.0	+22 38.6
19	103 49.9	38.3
20	118 49.8	38.1
21	133 49.7	37.8
22	148 49.6	37.6
23	163 49.5	37.3
7 00	178 49.4	+22 37.0
01	193 49.3	36.8
02	208 49.2	36.5
03	223 49.1	36.2
04	238 49.0	36.0
05	253 48.9	35.7
06	268 48.8	+22 35.5
07	283 48.7	35.2
08	298 48.6	34.9
09	313 48.5	34.6
10	328 48.4	34.4
11	343 48.3	34.1
12	358 48.2	+22 33.8
13	13 48.1	33.6
14	28 48.0	33.3
15	43 47.9	33.0
16	58 47.8	32.7
17	73 47.7	32.5
18	88 47.6	+22 32.2
19	103 47.5	31.9
20	118 47.4	31.6
21	133 47.3	31.4
22	148 47.2	31.1
23	163 47.1	30.8
24	178 47.0	+22 30.5
Mode	—	— 3

STARS No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 50.9	−40 28.4
5	Achernar	335 58.6	−57 27.1
30	Acrux	173 57.2	−62 51.9
19	Adhara	255 46.4	−28 54.8
10	Aldebaran	291 38.7	+16 25.4
32	Alioth	166 58.1	+56 11.9
34	Alkaid	153 32.3	+49 32.0
55	Al Na'ir	28 36.9	−47 10.0
15	Alnilam	276 30.0	− 1 13.7
25	Alphard	218 38.3	− 8 28.3
41	Alphecca	126 46.9	+26 51.7
1	Alpheratz	358 27.6	+28 51.0
51	Altair	62 49.5	+ 8 45.3
2	Ankaa	353 57.7	−42 32.2
42	Antares	113 18.3	−26 20.3
37	Arcturus	146 34.5	+19 24.6
43	Atria	108 58.0	−68 57.2
22	Avior	234 36.1	−59 22.3
13	Bellatrix	279 18.1	+ 6 18.7
16	Betelg'se	271 47.8	+ 7 24.0
17	Canopus	264 15.7	−52 40.3
12	Capella	281 38.0	+45 57.2
53	Deneb	50 00.1	+45 07.5
28	Denebola	183 17.2	+14 48.9
4	Diphda	349 38.7	−18 13.3
27	Dubhe	194 44.3	+61 59.3
14	Elnath	279 06.9	+28 34.3
47	Eltanin	91 05.4	+51 29.8
54	Enif	34 28.8	+ 9 40.6
56	Fomalhaut	16 10.8	−29 50.9
31	Gacrux	172 48.6	−56 52.6
29	Gienah	176 36.3	−17 18.2
35	Hadar	149 48.3	−60 10.2
6	Hamal	328 49.1	+23 15.4
48	Kaus Aust.	84 40.0	−34 24.3
40	Kochab	137 17.5	+74 20.3
57	Markab	14 20.7	+14 58.3
8	Menkar	314 59.9	+ 3 55.3
36	Menkent	148 57.8	−36 09.6
24	Miapl'dus	221 49.6	−69 32.6
9	Mirfak	309 41.8	+49 42.3
50	Nunki	76 50.8	−26 21.0
52	Peacock	54 25.8	−56 52.3
21	Pollux	244 20.2	+28 07.9
20	Procyon	245 44.7	+ 5 20.2
46	R'alhague	96 45.7	+12 35.5
26	Regulus	208 29.1	+12 10.8
11	Rigel	281 53.4	− 8 15.0
38	Rigil Kent.	140 49.8	−60 39.7
44	Sabik	103 01.2	−15 40.3
3	Schedar	350 29.2	+56 17.8
45	Shaula	97 19.5	−37 04.4
18	Sirius	259 11.7	−16 39.3
33	Spica	159 16.2	−10 56.2
23	Suhail	223 24.3	−43 15.6
49	Vega	81 07.4	+38 44.7
39	Zub'g'bi	137 52.5	−15 51.8

Lat. N °	Sunrise h m	Twlt. begins h m	Moonrise 5 h m	6 h m	7 h m	8 h m
72	□	□	□	□	□	□
70	□	□	□	□	□	0 43
68	□	□	22 27	23 43	25 53	1 53
66	0 52	////	23 36	24 46	0 46	2 30
64	1 51	////	24 12	0 12	1 21	2 56
62	2 24	////	24 38	0 38	1 46	3 16
60	2 48	////	0 12	0 59	2 06	3 32
58	3 07	////	0 27	1 16	2 23	3 46
56	3 23	////	0 39	1 30	2 37	3 57
54	3 36	////	0 51	1 42	2 49	4 08
52	3 48	////	1 00	1 53	2 59	4 17
50	3 59	////	1 09	2 03	3 09	4 25
45	4 20	1 51	1 28	2 23	3 29	4 43
40	4 37	2 36	1 43	2 40	3 45	4 57
35	4 52	3 05	1 56	2 54	3 59	5 09
30	5 04	3 29	2 08	3 06	4 10	5 20
20	5 26	4 02	2 27	3 27	4 31	5 38
10	5 44	4 27	2 44	3 45	4 49	5 53
0	6 01	4 46	3 00	4 02	5 05	6 08
10	6 18	5 03	3 17	4 19	5 22	6 22
20	6 36	5 18	3 34	4 37	5 39	6 38
30	6 56	5 31	3 54	4 58	6 00	6 56
35	7 08	5 38	4 05	5 10	6 11	7 06
40	7 22	5 45	4 19	5 25	6 25	7 18
45	7 38	5 52	4 35	5 41	6 41	7 32
50	7 58	6 00	4 55	6 02	7 01	7 49
52	8 07	6 03	5 04	6 12	7 10	7 57
54	8 18	6 06	5 14	6 23	7 21	8 06
56	8 30	6 09	5 26	6 36	7 33	8 15
58	8 44	6 13	5 40	6 51	7 46	8 27
60	9 00	6 18	5 56	7 08	8 03	8 40

Lat. N °	Sunset h m	Twlt. ends h m	Moonset 5 h m	6 h m	7 h m	8 h m
72	□	□	□	□	□	23 13
70	□	□	□	□	23 11	22 28
68	□	□	21 01	21 58	22 00	21 58
66	23 13	////	19 52	20 54	21 23	21 35
64	22 16	////	19 16	20 19	20 56	21 17
62	21 44	////	18 50	19 54	20 36	21 02
60	21 20	////	18 30	19 33	20 19	20 50
58	21 01	////	18 13	19 17	20 05	20 39
56	20 46	////	17 59	19 03	19 52	20 29
54	20 32	////	17 47	18 51	19 42	20 21
52	20 21	////	17 36	18 40	19 32	20 13
50	20 10	////	17 27	18 30	19 23	20 07
45	19 49	22 16	17 06	18 10	19 05	19 52
40	19 32	21 33	16 50	17 53	18 50	19 40
35	19 17	21 02	16 36	17 40	18 38	19 29
30	19 05	20 40	16 24	17 27	18 26	19 20
20	18 44	20 07	16 04	17 07	18 07	19 04
10	18 25	19 42	15 46	16 49	17 51	18 50
0	18 08	19 23	15 29	16 32	17 35	18 37
10	17 52	19 07	15 13	16 15	17 19	18 24
20	17 34	18 52	14 55	15 56	17 02	18 09
30	17 13	18 38	14 34	15 36	16 43	17 53
35	17 02	18 32	14 22	15 23	16 31	17 43
40	16 48	18 25	14 08	15 09	16 18	17 32
45	16 32	18 18	13 52	14 52	16 02	17 19
50	16 12	18 10	13 32	14 32	15 43	17 03
52	16 03	18 08	13 22	14 22	15 34	16 56
54	15 52	18 04	13 12	14 10	15 24	16 48
56	15 40	18 00	12 59	13 58	15 12	16 38
58	15 26	17 56	12 45	13 43	14 59	16 27
60	15 10	17 53	12 29	13 26	14 43	16 15

GMT	Equation of Time (App. − Mean) 5	6	7
h	m s	m s	m s
0	− 4 21.8	− 4 32.2	− 4 42.2
6	− 4 24.4	− 4 34.7	− 4 44.7
12	− 4 27.0	− 4 37.2	− 4 47.1
18	− 4 29.6	− 4 39.8	− 4 49.6
24	− 4 32.2	− 4 42.2	− 4 52.0

GMT of Transit
Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
5	9 15	10 41	4 21	15 14	20 44
6	10 17	10 36	4 19	15 11	20 40
7	11 20	10 30	4 16	15 07	20 36
8	12 22	10 26	4 14	15 04	20 32

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ,	Venus Add ,	Mars Add ,
0	0.1	0.4	0.2
30	0.1	0.4	0.2
45	0.1	0.3	0.2
60	0.1	0.2	0.1
75	0.1	0.1	0.0
90			

Moon's Lower Limb **Add**

Alt. °	5 ,	6 ,	7 ,
0	19.4	20.3	20.9
4	19.4	20.2	20.9
8	19.3	20.2	20.8
12	19.3	20.1	20.8
16	19.2	20.1	20.7
20	19.2	20.0	20.6
24	19.1	19.9	20.5
28	19.0	19.8	20.3
32	18.9	19.6	20.2
36	18.7	19.5	20.0
40	18.6	19.3	19.8
44	18.5	19.1	19.6
48	18.3	18.9	19.4
52	18.1	18.7	19.2
56	18.0	18.5	18.9
60	17.8	18.3	18.7
64	17.6	18.1	18.4
68	17.4	17.8	18.1
72	17.2	17.6	17.9
76	17.0	17.3	17.6
80	16.8	17.1	17.3
84	16.6	16.8	17.0
88	16.4	16.6	16.8
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt. °	5 ,	6 ,	7 ,
0	13.4	12.9	12.5
4	13.4	12.9	12.5
8	13.4	12.9	12.6
12	13.5	13.0	12.6
16	13.5	13.0	12.7
20	13.6	13.1	12.8
24	13.7	13.2	12.9
28	13.8	13.4	13.1
32	13.9	13.5	13.2
36	14.0	13.6	13.4
40	14.1	13.8	13.6
44	14.3	14.0	13.8
48	14.4	14.2	14.0
52	14.6	14.4	14.2
56	14.8	14.6	14.5
60	15.0	14.8	14.7
64	15.1	15.1	15.0
68	15.3	15.3	15.3
72	15.5	15.5	15.5
76	15.7	15.8	15.8
80	15.9	16.0	16.1
84	16.2	16.3	16.4
88	16.3	16.5	16.6
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.9 GHA	Dec.	MARS −1.2 GHA	Dec.	JUPITER −1.3 GHA	Dec.	SATURN 0.5 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
8 00	285 55.2	203 05.0	+18 27.4	296 27.9	− 9 15.2	133 26.5	+12 22.6	51 08.1	−17 20.1	182 03.4	36	+19 48.9	− 65
01	300 57.7	218 08.1	27.2	311 29.4	14.9	148 28.5	22.5	66 10.7	20.1	196 26.0	36	19 42.4	− 66
02	316 00.2	233 11.1	26.9	326 30.9	14.6	163 30.5	22.3	81 13.2	20.1	210 48.6	37	19 35.8	− 68
03	331 02.6	248 14.2	26.6	341 32.5	14.4	178 32.6	22.2	96 15.8	20.1	225 11.3	37	+19 29.0	− 70
04	346 05.1	263 17.2	26.3	356 34.0	14.1	193 34.6	22.0	111 18.4	20.0	239 34.0	38	19 22.0	− 70
05	1 07.5	278 20.3	26.1	11 35.6	13.9	208 36.6	21.8	126 20.9	20.0	253 56.8	38	19 15.0	− 72
06	16 10.0	293 23.3	+18 25.8	26 37.1	− 9 13.6	223 38.7	+12 21.7	141 23.5	−17 20.0	268 19.6	39	+19 07.8	− 74
07	31 12.5	308 26.3	25.5	41 38.7	13.4	238 40.7	21.5	156 26.0	20.0	282 42.5	39	19 00.4	− 75
08	46 14.9	323 29.4	25.3	56 40.2	13.1	253 42.7	21.3	171 28.6	20.0	297 05.4	40	18 52.9	− 76
09	61 17.4	338 32.4	25.0	71 41.7	12.9	268 44.7	21.2	186 31.1	20.0	311 28.4	41	18 45.3	− 78
10	76 19.9	353 35.4	24.8	86 43.3	12.6	283 46.8	21.0	201 33.7	20.0	325 51.5	41	18 37.5	− 79
11	91 22.3	8 38.4	24.5	101 44.8	12.4	298 48.8	20.8	216 36.2	20.0	340 14.6	42	18 29.6	− 81
12	106 24.8	23 41.4	+18 24.2	116 46.4	− 9 12.1	313 50.8	+12 20.7	231 38.8	−17 20.0	354 37.8	42	+18 21.5	− 82
13	121 27.3	38 44.4	24.0	131 47.9	11.9	328 52.9	20.5	246 41.4	19.9	9 01.0	43	18 13.3	− 83
14	136 29.7	53 47.4	23.7	146 49.5	11.6	343 54.9	20.4	261 43.9	19.9	23 24.3	44	18 05.0	− 84
15	151 32.2	68 50.4	23.4	161 51.0	11.4	358 56.9	20.2	276 46.5	19.9	37 47.7	44	17 56.6	− 86
16	166 34.7	83 53.4	23.2	176 52.6	11.1	13 58.9	20.0	291 49.0	19.9	52 11.1	45	17 48.0	− 87
17	181 37.1	98 56.4	22.9	191 54.1	10.9	29 01.0	19.9	306 51.6	19.9	66 34.6	46	17 39.3	− 88
18	196 39.6	113 59.4	+18 22.7	206 55.7	− 9 10.6	44 03.0	+12 19.7	321 54.1	−17 19.9	80 58.2	46	+17 30.5	− 90
19	211 42.0	129 02.3	22.4	221 57.2	10.4	59 05.0	19.5	336 56.7	19.9	95 21.8	47	17 21.5	− 91
20	226 44.5	144 05.3	22.2	236 58.8	10.1	74 07.0	19.4	351 59.2	19.9	109 45.5	48	17 12.4	− 92
21	241 47.0	159 08.3	21.9	252 00.3	09.9	89 09.1	19.2	7 01.8	19.9	124 09.3	49	17 03.2	− 93
22	256 49.4	174 11.3	21.7	267 01.9	09.6	104 11.1	19.0	22 04.3	19.8	138 33.2	49	16 53.9	− 94
23	271 51.9	189 14.2	21.4	282 03.4	09.4	119 13.1	18.9	37 06.9	19.8	152 57.1	50	16 44.5	− 96
9 00	286 54.4	204 17.2	+18 21.2	297 05.0	− 9 09.1	134 15.1	+12 18.7	52 09.4	−17 19.8	167 21.1	50	+16 34.9	− 96
01	301 56.8	219 20.1	20.9	312 06.6	08.9	149 17.2	18.6	67 12.0	19.8	181 45.1	52	16 25.3	− 98
02	316 59.3	234 23.1	20.7	327 08.1	08.7	164 19.2	18.4	82 14.5	19.8	196 09.3	52	16 15.5	− 99
03	332 01.8	249 26.0	20.4	342 09.7	08.4	179 21.2	18.2	97 17.1	19.8	210 33.5	53	16 05.6	−100
04	347 04.2	264 29.0	20.2	357 11.2	08.2	194 23.2	18.1	112 19.7	19.8	224 57.8	54	15 55.6	−101
05	2 06.7	279 31.9	20.0	12 12.8	07.9	209 25.3	17.9	127 22.2	19.8	239 22.2	54	15 45.5	−102
06	17 09.1	294 34.8	+18 19.7	27 14.3	− 9 07.7	224 27.3	+12 17.7	142 24.8	−17 19.8	253 46.6	55	+15 35.3	−103
07	32 11.6	309 37.8	19.5	42 15.9	07.4	239 29.3	17.6	157 27.3	19.8	268 11.1	56	15 25.0	−104
08	47 14.1	324 40.7	19.2	57 17.5	07.2	254 31.3	17.4	172 29.9	19.7	282 35.7	57	15 14.6	−106
09	62 16.5	339 43.6	19.0	72 19.0	06.9	269 33.4	17.2	187 32.4	19.7	297 00.4	58	15 04.0	−106
10	77 19.0	354 46.5	18.8	87 20.6	06.7	284 35.4	17.1	202 35.0	19.7	311 25.2	58	14 53.4	−107
11	92 21.5	9 49.4	18.5	102 22.2	06.5	299 37.4	16.9	217 37.5	19.7	325 50.0	59	14 42.7	−108
12	107 23.9	24 52.3	+18 18.3	117 23.7	− 9 06.2	314 39.4	+12 16.7	232 40.1	−17 19.7	340 14.9	60	+14 31.9	−109
13	122 26.4	39 55.2	18.1	132 25.3	06.0	329 41.5	16.6	247 42.6	19.7	354 39.9	61	14 21.0	−110
14	137 28.9	54 58.1	17.8	147 26.9	05.7	344 43.5	16.4	262 45.2	19.7	9 05.0	62	14 10.0	−111
15	152 31.3	70 01.0	17.6	162 28.4	05.5	359 45.5	16.2	277 47.7	19.7	23 30.2	62	13 58.9	−112
16	167 33.8	85 03.9	17.4	177 30.0	05.2	14 47.5	16.1	292 50.3	19.7	37 55.4	63	13 47.7	−113
17	182 36.3	100 06.8	17.2	192 31.6	05.0	29 49.6	15.9	307 52.8	19.7	52 20.7	64	13 36.4	−113
18	197 38.7	115 09.7	+18 16.9	207 33.1	− 9 04.8	44 51.6	+12 15.8	322 55.4	−17 19.6	66 46.1	65	+13 25.1	−114
19	212 41.2	130 12.5	16.7	222 34.7	04.5	59 53.6	15.6	337 57.9	19.6	81 11.6	66	13 13.7	−115
20	227 43.6	145 15.4	16.5	237 36.3	04.3	74 55.6	15.4	353 00.5	19.6	95 37.2	66	13 02.2	−116
21	242 46.1	160 18.3	16.3	252 37.9	04.0	89 57.7	15.3	8 03.0	19.6	110 02.8	67	12 50.6	−117
22	257 48.6	175 21.1	16.0	267 39.4	03.8	104 59.7	15.1	23 05.6	19.6	124 28.5	68	12 38.9	−118
23	272 51.0	190 24.0	15.8	282 41.0	03.6	120 01.7	14.9	38 08.1	19.6	138 54.3	69	12 27.1	−118
10 00	287 53.5	205 26.9	+18 15.6	297 42.6	− 9 03.3	135 03.7	+12 14.8	53 10.7	−17 19.6	153 20.2	70	+12 15.3	−119
01	302 56.0	220 29.7	15.4	312 44.2	03.1	150 05.8	14.6	68 13.2	19.6	167 46.2	70	12 03.4	−119
02	317 58.4	235 32.6	15.2	327 45.7	02.8	165 07.8	14.4	83 15.8	19.6	182 12.2	71	11 51.5	−121
03	333 00.9	250 35.4	14.9	342 47.3	02.6	180 09.8	14.3	98 18.3	19.6	196 38.3	73	11 39.4	−121
04	348 03.4	265 38.2	14.7	357 48.9	02.4	195 11.8	14.1	113 20.9	19.6	211 04.6	72	11 27.3	−121
05	3 05.8	280 41.1	14.5	12 50.5	02.1	210 13.8	13.9	128 23.4	19.5	225 30.8	74	11 15.2	−122
06	18 08.3	295 43.9	+18 14.3	27 52.1	− 9 01.9	225 15.9	+12 13.8	143 26.0	−17 19.5	239 57.2	74	+11 03.0	−123
07	33 10.8	310 46.7	14.1	42 53.6	01.7	240 17.9	13.6	158 28.5	19.5	254 23.6	76	10 50.7	−124
08	48 13.2	325 49.5	13.9	57 55.2	01.4	255 19.9	13.4	173 31.1	19.5	268 50.2	76	10 38.3	−124
09	63 15.7	340 52.3	13.7	72 56.8	01.2	270 21.9	13.3	188 33.6	19.5	283 16.8	76	10 25.9	−124
10	78 18.1	355 55.2	13.4	87 58.4	00.9	285 24.0	13.1	203 36.1	19.5	297 43.4	78	10 13.5	−125
11	93 20.6	10 58.0	13.2	103 00.0	00.7	300 26.0	12.9	218 38.7	19.5	312 10.2	78	10 01.0	−126
12	108 23.1	26 00.8	+18 13.0	118 01.6	− 9 00.5	315 28.0	+12 12.8	233 41.2	−17 19.5	326 37.0	79	+ 9 48.4	−126
13	123 25.5	41 03.6	12.8	133 03.1	00.2	330 30.0	12.6	248 43.8	19.5	341 03.9	80	9 35.8	−127
14	138 28.0	56 06.4	12.6	148 04.7	9 00.0	345 32.0	12.4	263 46.3	19.5	355 30.9	81	9 23.1	−127
15	153 30.5	71 09.1	12.4	163 06.3	8 59.8	0 34.1	12.3	278 48.9	19.5	9 58.0	81	9 10.4	−127
16	168 32.9	86 11.9	12.2	178 07.9	59.5	15 36.1	12.1	293 51.4	19.4	24 25.1	82	8 57.7	−128
17	183 35.4	101 14.7	12.0	193 09.5	59.3	30 38.1	11.9	308 54.0	19.4	38 52.3	83	8 44.9	−129
18	198 37.9	116 17.5	+18 11.8	208 11.1	− 8 59.1	45 40.1	+12 11.8	323 56.5	−17 19.4	53 19.6	84	+ 8 32.0	−129
19	213 40.3	131 20.3	11.6	223 12.7	58.8	60 42.1	11.6	338 59.1	19.4	67 47.0	84	8 19.1	−129
20	228 42.8	146 23.0	11.4	238 14.3	58.6	75 44.2	11.4	354 01.6	19.4	82 14.4	85	8 06.2	−129
21	243 45.3	161 25.8	11.2	253 15.9	58.4	90 46.2	11.3	9 04.2	19.4	96 41.9	86	7 53.3	−130
22	258 47.7	176 28.6	11.0	268 17.5	58.1	105 48.2	11.1	24 06.7	19.4	111 09.5	86	7 40.3	−130
23	273 50.2	191 31.3	10.8	283 19.1	57.9	120 50.2	10.9	39 09.3	19.4	125 37.1	87	7 27.3	−131
24	288 52.6	206 34.1	+18 10.6	298 20.6	− 8 57.7	135 52.3	+12 10.8	54 11.8	−17 19.4	140 04.8	88	+ 7 14.2	−131
code	—	+ 29	− 2	+ 16	+ 2	+ 21	− 1	+ 25	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
8 0	178 47.0	+22 30.5
1	193 46.9	30.2
2	208 46.8	30.0
3	223 46.7	·· 29.7
4	238 46.6	29.4
5	253 46.5	29.1
6	268 46.4	+22 28.8
7	283 46.3	28.6
8	298 46.2	28.3
9	313 46.1	·· 28.0
10	328 46.0	27.7
11	343 45.9	27.4
12	358 45.8	+22 27.1
13	13 45.7	26.8
14	28 45.6	26.5
15	43 45.5	·· 26.3
16	58 45.4	26.0
17	73 45.3	25.7
18	88 45.2	+22 25.4
19	103 45.1	25.1
20	118 45.0	24.8
21	133 44.9	·· 24.5
22	148 44.8	24.2
23	163 44.7	23.9
9 0	178 44.6	+22 23.6
1	193 44.5	23.3
2	208 44.4	23.0
3	223 44.3	·· 22.7
4	238 44.3	22.4
5	253 44.2	22.1
6	268 44.1	+22 21.8
7	283 44.0	21.5
8	298 43.9	21.2
9	313 43.8	·· 20.9
10	328 43.7	20.6
11	343 43.6	20.3
12	358 43.5	+22 20.0
13	13 43.4	19.7
14	28 43.3	19.4
15	43 43.2	·· 19.1
16	58 43.1	18.8
17	73 43.0	18.5
18	88 43.0	+22 18.2
19	103 42.9	17.9
20	118 42.8	17.6
21	133 42.7	·· 17.3
22	148 42.6	17.0
23	163 42.5	16.6
10 0	178 42.4	+22 16.3
1	193 42.3	16.0
2	208 42.2	15.7
3	223 42.1	·· 15.4
4	238 42.0	15.1
5	253 42.0	14.8
6	268 41.9	+22 14.4
7	283 41.8	14.1
8	298 41.7	13.8
9	313 41.6	·· 13.5
10	328 41.5	13.2
11	343 41.4	12.9
12	358 41.3	+22 12.5
13	13 41.2	12.2
14	28 41.2	11.9
15	43 41.1	·· 11.6
16	58 41.0	11.3
17	73 40.9	10.9
18	88 40.8	+22 10.6
19	103 40.7	10.3
20	118 40.6	10.0
21	133 40.5	·· 09.6
22	148 40.5	09.3
23	163 40.4	09.0
24	178 40.3	+22 08.7
Mean code	—	− 3

STARS No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 50.9	−40 28.4
5	Achernar	335 58.5	−57 27.0
30	Acrux	173 57.2	−62 51.9
19	Adhara	255 46.4	−28 54.8
10	Aldebaran	291 38.7	+16 25.4
32	Alioth	166 58.1	+56 11.9
34	Alkaid	153 32.4	+49 32.0
55	Al Na'ir	28 36.9	−47 10.0
15	Alnilam	276 30.0	− 1 13.7
25	Alphard	218 38.3	− 8 28.3
41	Alphecca	126 46.9	+26 51.7
1	Alpheratz	358 27.6	+28 51.0
51	Altair	62 49.5	+ 8 45.3
2	Ankaa	353 57.6	−42 32.2
42	Antares	113 18.3	−26 20.3
37	Arcturus	146 34.5	+19 24.6
43	Atria	108 58.0	−68 57.2
22	Avior	234 36.1	−59 22.3
13	Bellatrix	279 18.1	+ 6 18.7
16	Betelg'se	271 47.8	+ 7 24.0
17	Canopus	264 15.6	−52 40.3
12	Capella	281 38.0	+45 57.2
53	Deneb	50 00.1	+45 07.5
28	Denebola	183 17.2	+14 48.9
4	Diphda	349 38.6	−18 13.3
27	Dubhe	194 44.3	+61 59.3
14	Elnath	279 06.9	+28 34.3
47	Eltanin	91 05.4	+51 29.8
54	Enif	34 28.7	+ 9 40.6
56	Fomalhaut	16 10.8	−29 50.9
31	Gacrux	172 48.6	−56 52.6
29	Gienah	176 36.3	−17 18.2
35	Hadar	149 48.3	−60 10.2
6	Hamal	328 49.1	+23 15.4
48	Kaus Aust.	84 40.0	−34 24.4
40	Kochab	137 17.5	+74 20.3
57	Markab	14 20.7	+14 58.3
8	Menkar	314 59.9	+ 3 55.3
36	Menkent	148 57.8	−36 09.6
24	Miapl'dus	221 49.6	−69 32.6
9	Mirfak	309 41.8	+49 42.3
50	Nunki	76 50.8	−26 21.0
52	Peacock	54 25.8	−56 52.3
21	Pollux	244 20.2	+28 07.9
20	Procyon	245 44.7	+ 5 20.2
46	R'alhague	96 45.7	+12 35.5
26	Regulus	208 29.1	+12 10.8
11	Rigel	281 53.4	− 8 15.0
38	Rigil Kent.	140 49.8	−60 39.8
44	Sabik	103 01.2	−15 40.3
3	Schedar	350 29.2	+56 17.8
45	Shaula	97 19.5	−37 04.4
18	Sirius	259 11.7	−16 39.3
33	Spica	159 16.2	−10 56.2
23	Suhail	223 24.3	−43 15.6
49	Vega	81 07.4	+38 44.7
39	Zub'g'bi	137 52.5	−15 51.8

Lat. N °	Sunrise h m	Twlt. begins h m	Moonrise 8 h m	9 h m	10 h m	11 h m
72	□	□	□	2 52	5 33	7 49
70	□	□	0 43	3 35	5 52	7 58
68	□	□	1 53	4 03	6 07	8 04
66	1 07	////	2 30	4 25	6 19	8 09
64	1 58	////	2 56	4 42	6 30	8 14
62	2 30	////	3 16	4 56	6 38	8 18
60	2 53	////	3 32	5 08	6 46	8 21
58	3 11	////	3 46	5 18	6 52	8 24
56	3 26	////	3 57	5 27	6 58	8 27
54	3 40	////	4 08	5 35	7 03	8 29
52	3 51	////	4 17	5 42	7 07	8 31
50	4 01	////	4 25	5 48	7 11	8 33
45	4 22	1 55	4 43	6 01	7 20	8 38
40	4 39	2 39	4 57	6 12	7 28	8 41
35	4 53	3 08	5 09	6 22	7 34	8 44
30	5 06	3 30	5 20	6 30	7 40	8 47
20	5 27	4 03	5 38	6 44	7 49	8 52
10	5 45	4 28	5 53	6 57	7 58	8 56
0	6 02	4 46	6 08	7 08	8 06	9 00
10	6 18	5 03	6 22	7 20	8 13	9 03
20	6 36	5 18	6 38	7 32	8 22	9 07
30	6 56	5 31	6 56	7 46	8 31	9 12
35	7 07	5 38	7 06	7 54	8 37	9 15
40	7 21	5 44	7 18	8 04	8 43	9 18
45	7 37	5 51	7 32	8 14	8 50	9 21
50	7 56	5 59	7 49	8 27	8 59	9 26
52	8 05	6 02	7 57	8 33	9 03	9 28
54	8 16	6 05	8 06	8 40	9 07	9 30
56	8 27	6 08	8 15	8 47	9 12	9 32
58	8 41	6 12	8 27	8 56	9 17	9 34
60	8 57	6 16	8 40	9 05	9 23	9 37

Lat. N °	Sunset h m	Twlt. ends h m	Moonset 8 h m	9 h m	10 h m	11 h m
72	□	□	23 13	22 33	22 11	21 53
70	□	□	22 28	22 12	22 00	21 50
68	□	□	21 58	21 55	21 51	21 48
66	22 59	////	21 35	21 41	21 44	21 46
64	22 10	////	21 17	21 30	21 38	21 44
62	21 39	////	21 02	21 20	21 32	21 42
60	21 16	////	20 50	21 11	21 28	21 41
58	20 58	////	20 39	21 04	21 23	21 40
56	20 43	////	20 29	20 57	21 20	21 39
54	20 30	////	20 21	20 51	21 16	21 38
52	20 19	////	20 13	20 46	21 13	21 37
50	20 09	////	20 07	20 41	21 10	21 36
45	19 48	22 13	19 52	20 31	21 04	21 34
40	19 31	21 31	19 40	20 22	20 59	21 33
35	19 17	21 02	19 29	20 14	20 55	21 31
30	19 04	20 39	19 20	20 08	20 51	21 30
20	18 43	20 06	19 04	19 56	20 44	21 28
10	18 25	19 42	18 50	19 46	20 37	21 26
0	18 09	19 23	18 37	19 36	20 32	21 24
10	17 52	19 07	18 24	19 26	20 26	21 22
20	17 35	18 53	18 09	19 16	20 19	21 20
30	17 15	18 40	17 53	19 03	20 12	21 18
35	17 03	18 33	17 43	18 56	20 08	21 17
40	16 50	18 27	17 32	18 48	20 03	21 15
45	16 34	18 20	17 19	18 39	19 57	21 13
50	16 15	18 13	17 03	18 27	19 50	21 11
52	16 05	18 09	16 56	18 22	19 47	21 10
54	15 55	18 06	16 48	18 16	19 44	21 09
56	15 43	18 02	16 38	18 09	19 40	21 08
58	15 30	17 59	16 27	18 02	19 36	21 06
60	15 14	17 55	16 15	17 53	19 31	21 05

GMT h	Equation of Time (App.—Mean) 8 m s	9 m s	10 m s
0	− 4 52.0	− 5 01.3	− 5 10.2
6	− 4 54.3	− 5 03.5	− 5 12.4
12	− 4 56.7	− 5 05.8	− 5 14.5
18	− 4 59.0	− 5 08.0	− 5 16.6
24	− 5 01.3	− 5 10.2	− 5 18.7

DAY	GMT of Transit Meridian of Greenwich: Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
8	12 22	10 26	4 14	15 04	20 32
9	13 22	10 21	4 11	15 01	20 28
10	14 19	10 16	4 09	14 58	20 24
11	15 12	10 12	4 06	14 55	20 20

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.1	0.4	0.2
30	0.1	0.4	0.2
45	0.1	0.3	0.2
60	0.1	0.2	0.1
75	0.1	0.1	0.0
90			

Moon's Lower Limb **Add**

Alt. °	8 ′	9 ′	10 ′
0	21.1	20.9	20.3
4	21.1	20.9	20.2
8	21.1	20.8	20.2
12	21.0	20.8	20.1
16	20.9	20.7	20.1
20	20.8	20.6	20.0
24	20.7	20.5	19.9
28	20.6	20.3	19.8
32	20.4	20.2	19.6
36	20.2	20.0	19.5
40	20.0	19.8	19.3
44	19.8	19.6	19.1
48	19.6	19.4	18.9
52	19.3	19.2	18.7
56	19.1	18.9	18.5
60	18.8	18.7	18.3
64	18.5	18.4	18.1
68	18.3	18.1	17.8
72	18.0	17.9	17.6
76	17.7	17.6	17.3
80	17.4	17.3	17.1
84	17.1	17.0	16.8
88	16.8	16.8	16.6
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt. °	8 ′	9 ′	10 ′
0	12.4	12.5	12.9
4	12.4	12.5	12.9
8	12.4	12.6	12.9
12	12.5	12.6	13.0
16	12.6	12.7	13.0
20	12.7	12.8	13.1
24	12.8	12.9	13.2
28	12.9	13.1	13.4
32	13.2	13.2	13.5
36	13.3	13.4	13.6
40	13.5	13.6	13.8
44	13.7	13.8	14.0
48	13.9	14.0	14.2
52	14.2	14.2	14.4
56	14.4	14.5	14.6
60	14.7	14.7	14.8
64	15.0	15.0	15.1
68	15.2	15.3	15.3
72	15.5	15.5	15.5
76	15.8	15.8	15.8
80	16.1	16.1	16.0
84	16.4	16.4	16.3
88	16.7	16.6	16.5
90			

Subtract from table, back cover

New Moon 8

GMT	♈ GHA	VENUS −4.0 GHA	Dec.	MARS −1.3 GHA	Dec.	JUPITER −1.3 GHA	Dec.	SATURN 0.5 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
11 00	288 52.6	206 34.1	+18 10.6	298 20.6	− 8 57.7	135 52.3	+12 10.8	54 11.8	−17 19.4	140 04.8	88	+ 7 14.2	−131
01	303 55.1	221 36.8	10.5	313 22.2	57.5	150 54.3	10.6	69 14.3	19.4	154 32.6	89	7 01.1	−131
02	318 57.6	236 39.6	10.3	328 23.8	57.2	165 56.3	10.4	84 16.9	19.4	169 00.5	89	6 48.0	−131
03	334 00.0	251 42.3	.. 10.1	343 25.4	.. 57.0	180 58.3	.. 10.3	99 19.4	.. 19.3	183 28.4	90	• 6 34.9	−132
04	349 02.5	266 45.0	09.9	358 27.0	56.8	196 00.3	10.1	114 22.0	19.3	197 56.4	91	6 21.7	−132
05	4 05.0	281 47.8	09.7	13 28.6	56.5	211 02.4	09.9	129 24.5	19.3	212 24.5	91	6 08.5	−132
06	19 07.4	296 50.5	+18 09.5	28 30.2	− 8 56.3	226 04.4	+12 09.8	144 27.1	−17 19.3	226 52.6	92	+ 5 55.3	−132
07	34 09.9	311 53.2	09.3	43 31.8	56.1	241 06.4	09.6	159 29.6	19.3	241 20.8	92	5 42.1	−133
08	49 12.4	326 55.9	09.1	58 33.4	55.9	256 08.4	09.4	174 32.2	19.3	255 49.0	94	5 28.8	−132
09	64 14.8	341 58.6	.. 09.0	73 35.0	.. 55.6	271 10.4	.. 09.3	189 34.7	.. 19.3	270 17.4	93	• 5 15.6	−133
10	79 17.3	357 01.3	08.8	88 36.6	55.4	286 12.5	09.1	204 37.2	19.3	284 45.7	95	5 02.3	−133
11	94 19.8	12 04.0	08.6	103 38.3	55.2	301 14.5	08.9	219 39.8	19.3	299 14.2	95	4 49.0	−133
12	109 22.2	27 06.7	+18 08.4	118 39.9	− 8 54.9	316 16.5	+12 08.8	234 42.3	−17 19.3	313 42.7	96	+ 4 35.7	−133
13	124 24.7	42 09.4	08.2	133 41.5	54.7	331 18.5	08.6	249 44.9	19.3	328 11.3	96	4 22.4	−134
14	139 27.1	57 12.1	08.1	148 43.1	54.5	346 20.5	08.4	264 47.4	19.3	342 39.9	97	4 09.0	−133
15	154 29.6	72 14.8	.. 07.9	163 44.7	.. 54.3	1 22.5	.. 08.3	279 50.0	.. 19.2	357 08.6	97	• 3 55.7	−133
16	169 32.1	87 17.5	07.7	178 46.3	54.0	16 24.6	08.1	294 52.5	19.2	11 37.3	98	3 42.4	−134
17	184 34.5	102 20.2	07.5	193 47.9	53.8	31 26.6	07.9	309 55.0	19.2	26 06.1	99	3 29.0	−133
18	199 37.0	117 22.9	+18 07.4	208 49.5	− 8 53.6	46 28.6	+12 07.8	324 57.6	−17 19.2	40 35.0	99	+ 3 15.7	−134
19	214 39.5	132 25.5	07.2	223 51.1	53.4	61 30.6	07.6	340 00.1	19.2	55 03.9	100	3 02.3	−133
20	229 41.9	147 28.2	07.0	238 52.7	53.1	76 32.6	07.4	355 02.7	19.2	69 32.9	100	2 49.0	−134
21	244 44.4	162 30.9	.. 06.8	253 54.3	.. 52.9	91 34.7	.. 07.3	10 05.2	.. 19.2	84 01.9	101	• 2 35.6	−133
22	259 46.9	177 33.5	06.7	268 56.0	52.7	106 36.7	07.1	25 07.8	19.2	98 31.0	101	2 22.3	−134
23	274 49.3	192 36.2	06.5	283 57.6	52.5	121 38.7	06.9	40 10.3	19.2	113 00.1	102	2 08.9	−133
12 00	289 51.8	207 38.8	+18 06.3	298 59.2	− 8 52.2	136 40.7	+12 06.8	55 12.8	−17 19.2	127 29.3	102	+ 1 55.6	−134
01	304 54.2	222 41.5	06.2	314 00.8	52.0	151 42.7	06.6	70 15.4	19.2	141 58.5	103	1 42.2	−133
02	319 56.7	237 44.1	06.0	329 02.4	51.8	166 44.8	06.4	85 17.9	19.2	156 27.8	103	1 28.9	−133
03	334 59.2	252 46.7	.. 05.9	344 04.0	.. 51.6	181 46.8	.. 06.3	100 20.5	.. 19.2	170 57.1	104	• 1 15.6	−133
04	350 01.6	267 49.4	05.7	359 05.7	51.4	196 48.8	06.1	115 23.0	19.1	185 26.5	104	1 02.3	−133
05	5 04.1	282 52.0	05.5	14 07.3	51.1	211 50.8	05.9	130 25.5	19.1	199 55.9	105	0 49.0	−133
06	20 06.6	297 54.6	+18 05.4	29 08.9	− 8 50.9	226 52.8	+12 05.8	145 28.1	−17 19.1	214 25.4	105	+ 0 35.7	−133
07	35 09.0	312 57.2	05.2	44 10.5	50.7	241 54.8	05.6	160 30.6	19.1	228 54.9	106	0 22.4	−132
08	50 11.5	327 59.9	05.1	59 12.1	50.5	256 56.9	05.4	175 33.2	19.1	243 24.5	106	+ 0 09.2	−133
09	65 14.0	343 02.5	.. 04.9	74 13.8	.. 50.3	271 58.9	.. 05.3	190 35.7	.. 19.1	257 54.1	107	− 0 04.1	−132
10	80 16.4	358 05.1	04.7	89 15.4	50.0	287 00.9	05.1	205 38.2	19.1	272 23.8	106	0 17.3	−132
11	95 18.9	13 07.7	04.6	104 17.0	49.8	302 02.9	04.9	220 40.8	19.1	286 53.4	108	0 30.5	−132
12	110 21.4	28 10.3	+18 04.4	119 18.6	− 8 49.6	317 04.9	+12 04.7	235 43.3	−17 19.1	301 23.2	108	− 0 43.7	−131
13	125 23.8	43 12.9	04.3	134 20.3	49.4	332 06.9	04.6	250 45.9	19.1	315 53.0	108	0 56.8	−132
14	140 26.3	58 15.5	04.1	149 21.9	49.2	347 09.0	04.4	265 48.4	19.1	330 22.8	108	1 10.0	−131
15	155 28.7	73 18.0	.. 04.0	164 23.5	.. 48.9	2 11.0	.. 04.2	280 50.9	.. 19.1	344 52.6	109	• 1 23.1	−131
16	170 31.2	88 20.6	03.8	179 25.2	48.7	17 13.0	04.1	295 53.5	19.1	359 22.5	109	1 36.2	−130
17	185 33.7	103 23.2	03.7	194 26.8	48.5	32 15.0	03.9	310 56.0	19.1	13 52.4	110	1 49.2	−131
18	200 36.1	118 25.8	+18 03.5	209 28.4	− 8 48.3	47 17.0	+12 03.7	325 58.6	−17 19.0	28 22.4	110	− 2 02.3	−130
19	215 38.6	133 28.3	03.4	224 30.1	48.1	62 19.0	03.6	341 01.1	19.0	42 52.4	110	2 15.3	−129
20	230 41.1	148 30.9	03.2	239 31.7	47.9	77 21.1	03.4	356 03.6	19.0	57 22.4	111	2 28.2	−130
21	245 43.5	163 33.5	.. 03.1	254 33.3	.. 47.6	92 23.1	.. 03.2	11 06.2	.. 19.0	71 52.5	111	• 2 41.2	−129
22	260 46.0	178 36.0	03.0	269 35.0	47.4	107 25.1	03.1	26 08.7	19.0	86 22.6	111	2 54.1	−129
23	275 48.5	193 38.6	02.8	284 36.6	47.2	122 27.1	02.9	41 11.2	19.0	100 52.7	111	3 07.0	−128
13 00	290 50.9	208 41.1	+18 02.7	299 38.2	− 8 47.0	137 29.1	+12 02.7	56 13.8	−17 19.0	115 22.8	112	− 3 19.8	−128
01	305 53.4	223 43.7	02.5	314 39.9	46.8	152 31.1	02.6	71 16.3	19.0	129 53.0	112	3 32.6	−128
02	320 55.9	238 46.2	02.4	329 41.5	46.6	167 33.2	02.4	86 18.9	19.0	144 23.2	113	3 45.4	−127
03	335 58.3	253 48.7	.. 02.3	344 43.1	.. 46.4	182 35.2	.. 02.2	101 21.4	.. 19.0	158 53.5	112	• 3 58.1	−127
04	351 00.8	268 51.3	02.1	359 44.8	46.2	197 37.2	02.0	116 23.9	19.0	173 23.7	113	4 10.8	−127
05	6 03.2	283 53.8	02.0	14 46.4	45.9	212 39.2	01.9	131 26.5	19.0	187 54.0	113	4 23.5	−126
06	21 05.7	298 56.3	+18 01.8	29 48.1	− 8 45.7	227 41.2	+12 01.7	146 29.0	−17 19.0	202 24.3	114	− 4 36.1	−126
07	36 08.2	313 58.8	01.7	44 49.7	45.5	242 43.2	01.5	161 31.5	19.0	216 54.7	114	4 48.7	−125
08	51 10.6	329 01.4	01.6	59 51.3	45.3	257 45.2	01.4	176 34.1	19.0	231 25.1	113	5 01.2	−125
09	66 13.1	344 03.9	.. 01.5	74 53.0	.. 45.1	272 47.3	.. 01.2	191 36.6	.. 18.9	245 55.4	115	• 5 13.7	−125
10	81 15.6	359 06.4	01.3	89 54.6	44.9	287 49.3	01.0	206 39.2	18.9	260 25.9	114	5 26.2	−124
11	96 18.0	14 08.9	01.2	104 56.3	44.7	302 51.3	00.9	221 41.7	18.9	274 56.3	114	5 38.6	−124
12	111 20.5	29 11.4	+18 01.1	119 57.9	− 8 44.5	317 53.3	+12 00.7	236 44.2	−17 18.9	289 26.7	115	− 5 51.0	−123
13	126 23.0	44 13.9	00.9	134 59.6	44.2	332 55.3	00.5	251 46.8	18.9	303 57.2	115	6 03.3	−122
14	141 25.4	59 16.4	00.8	150 01.2	44.0	347 57.3	00.4	266 49.3	18.9	318 27.7	115	6 15.5	−123
15	156 27.9	74 18.8	.. 00.7	165 02.9	.. 43.8	2 59.3	.. 00.2	281 51.8	.. 18.9	332 58.2	115	• 6 27.8	−121
16	171 30.3	89 21.3	00.6	180 04.5	43.6	18 01.4	12 00.0	296 54.4	18.9	347 28.7	116	6 39.9	−121
17	186 32.8	104 23.8	00.4	195 06.2	43.4	33 03.4	11 59.8	311 56.9	18.9	1 59.3	115	6 52.0	−121
18	201 35.3	119 26.3	+18 00.3	210 07.8	− 8 43.2	48 05.4	+11 59.7	326 59.4	−17 18.9	16 29.8	116	− 7 04.1	−120
19	216 37.7	134 28.7	00.2	225 09.5	43.0	63 07.4	59.5	342 02.0	18.9	31 00.4	116	7 16.1	−120
20	231 40.2	149 31.2	00.1	240 11.1	42.8	78 09.4	59.3	357 04.5	18.9	45 31.0	116	7 28.1	−119
21	246 42.7	164 33.7	−18 00.0	255 12.8	.. 42.6	93 11.4	.. 59.2	12 07.0	.. 18.9	60 01.6	116	• 7 40.0	−118
22	261 45.1	179 36.1	17 59.8	270 14.4	42.4	108 13.4	59.0	27 09.6	18.9	74 32.2	116	7 51.8	−118
23	276 47.6	194 38.6	59.7	285 16.1	42.2	123 15.5	58.8	42 12.1	18.9	89 02.8	117	8 03.6	−118
24	291 50.1	209 41.0	+17 59.6	300 17.8	− 8 42.0	138 17.5	+11 58.7	57 14.6	−17 18.9	103 33.5	116	− 8 15.4	−116
code	—	+ 26	− 1	+ 17	+ 2	+ 20	− 1	+ 26	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
11 00	178 40.3	+22 08.7
01	193 40.2	08.3
02	208 40.1	08.0
03	223 40.0	07.7
04	238 39.9	07.3
05	253 39.9	07.0
06	268 39.8	+22 06.7
07	283 39.7	06.3
08	298 39.6	06.0
09	313 39.5	05.7
10	328 39.4	05.3
11	343 39.4	05.0
12	358 39.3	+22 04.7
13	13 39.2	04.3
14	28 39.1	04.0
15	43 39.0	03.7
16	58 38.9	03.3
17	73 38.9	03.0
18	88 38.8	+22 02.7
19	103 38.7	02.3
20	118 38.6	02.0
21	133 38.5	01.6
22	148 38.4	01.3
23	163 38.4	00.9
12 00	178 38.3	+22 00.6
01	193 38.2	22 00.3
02	208 38.1	21 59.9
03	223 38.0	59.6
04	238 38.0	59.2
05	253 37.9	58.9
06	268 37.8	+21 58.5
07	283 37.7	58.2
08	298 37.6	57.8
09	313 37.6	57.5
10	328 37.5	57.1
11	343 37.4	56.8
12	358 37.3	+21 56.4
13	13 37.2	56.1
14	28 37.2	55.7
15	43 37.1	55.4
16	58 37.0	55.0
17	73 36.9	54.7
18	88 36.9	+21 54.3
19	103 36.8	54.0
20	118 36.7	53.6
21	133 36.6	53.2
22	148 36.6	52.9
23	163 36.5	52.5
13 00	178 36.4	+21 52.2
01	193 36.3	51.8
02	208 36.2	51.5
03	223 36.2	51.1
04	238 36.1	50.7
05	253 36.0	50.4
06	268 35.9	+21 50.0
07	283 35.9	49.6
08	298 35.8	49.3
09	313 35.7	48.9
10	328 35.7	48.5
11	343 35.6	48.2
12	358 35.5	+21 47.8
13	13 35.4	47.4
14	28 35.4	47.1
15	43 35.3	46.7
16	58 35.2	46.3
17	73 35.1	46.0
18	88 35.1	+21 45.6
19	103 35.0	45.2
20	118 34.9	44.9
21	133 34.9	44.5
22	148 34.8	44.1
23	163 34.7	43.7
24	178 34.6	+21 43.4
code	—	− 3

STARS No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 50.9	−40 28.4
5	Achernar	335 58.5	−57 27.0
30	Acrux	173 57.2	−62 51.9
19	Adhara	255 46.4	−28 54.7
10	Aldebaran	291 38.6	+16 25.4
32	Alioth	166 58.1	+56 11.9
34	Alkaid	153 32.4	+49 32.0
55	Al Na'ir	28 36.8	−47 10.0
15	Alnilam	276 30.0	− 1 13.7
25	Alphard	218 38.3	− 8 28.3
41	Alphecca	126 46.9	+26 51.8
1	Alpheratz	358 27.6	+28 51.0
51	Altair	62 49.5	+ 8 45.3
2	Ankaa	353 57.6	−42 32.1
42	Antares	113 18.3	−26 20.3
37	Arcturus	146 34.5	+19 24.6
43	Atria	108 58.0	−68 57.2
22	Avior	234 36.1	−59 22.3
13	Bellatrix	279 18.1	+ 6 18.7
16	Betelg'se	271 47.8	+ 7 24.0
17	Canopus	264 15.6	−52 40.3
12	Capella	281 37.9	+45 57.2
53	Deneb	50 00.1	+45 07.5
28	Denebola	183 17.3	+14 48.9
4	Diphda	349 38.6	−18 13.2
27	Dubhe	194 44.3	+61 59.3
14	Elnath	279 06.9	+28 34.3
47	Eltanin	91 05.5	+51 29.8
54	Enif	34 28.7	+ 9 40.6
56	Fomalhaut	16 10.7	−29 50.9
31	Gacrux	172 48.6	−56 52.5
29	Gienah	176 36.3	−17 18.2
35	Hadar	149 48.4	−60 10.2
6	Hamal	328 49.0	+23 15.4
48	Kaus Aust.	84 40.0	−34 24.4
40	Kochab	137 17.6	+74 20.3
57	Markab	14 20.6	+14 58.4
8	Menkar	314 59.8	+ 3 55.3
36	Menkent	148 57.8	−36 09.6
24	Miapl'dus	221 49.7	−69 32.5
9	Mirfak	309 41.8	+49 42.3
50	Nunki	76 50.8	−26 21.0
52	Peacock	54 25.8	−56 52.4
21	Pollux	244 20.2	+28 07.9
20	Procyon	245 44.7	+ 5 20.2
46	R'alhague	96 45.7	+12 35.6
26	Regulus	208 29.1	+12 10.8
11	Rigel	281 53.4	− 8 15.0
38	Rigil Kent.	140 49.9	−60 39.8
44	Sabik	103 01.2	−15 40.3
3	Schedar	350 29.1	+56 17.8
45	Shaula	97 19.5	−37 04.4
18	Sirius	259 11.7	−16 39.3
33	Spica	159 16.2	−10 56.2
23	Suhail	223 24.3	−43 15.6
49	Vega	81 07.4	+38 44.7
39	Zub'g'bi	137 52.5	−15 51.8

Lat. N °	Sunrise h m	Twlt. begins h m
72	□	□
70	□	□
68	□	□
66	1 21	////
64	2 07	////
62	2 36	////
60	2 58	////
58	3 16	////
56	3 30	////
54	3 43	////
52	3 54	////
50	4 04	////
45	4 25	2 01
40	4 41	2 42
35	4 55	3 11
30	5 07	3 32
20	5 28	4 04
10	5 46	4 28
0	6 02	4 48
10	6 18	5 03
20	6 35	5 18
30	6 55	5 30
35	7 07	5 37
40	7 20	5 44
45	7 35	5 51
50	7 54	5 58
52	8 03	6 01
54	8 13	6 03
56	8 25	6 06
58	8 38	6 11
60	8 53	6 14
S		

Lat. N °	Sunset h m	Twlt. ends h m
72	□	□
70	□	□
68	□	□
66	22 46	////
64	22 02	////
62	21 34	////
60	21 12	////
58	20 55	////
56	20 40	////
54	20 27	////
52	20 16	////
50	20 06	23 45
45	19 46	22 09
40	19 29	21 27
35	19 16	21 00
30	19 03	20 37
20	18 43	20 06
10	18 26	19 43
0	18 09	19 23
10	17 53	19 08
20	17 36	18 54
30	17 16	18 41
35	17 05	18 35
40	16 52	18 28
45	16 36	18 21
50	16 17	18 14
52	16 08	18 11
54	15 58	18 08
56	15 47	18 05
58	15 34	18 02
60	15 19	17 59
S		

Moonrise	11	12	13	14
	h m	h m	h m	h m
N 72	7 49	9 56	11 57	14 01
70	7 58	9 55	11 49	13 41
68	8 04	9 55	11 41	13 26
66	8 09	9 54	11 35	13 14
64	8 14	9 54	11 30	13 04
62	8 18	9 54	11 26	12 55
60	8 21	9 53	11 22	12 48
58	8 24	9 53	11 19	12 42
56	8 27	9 53	11 16	12 36
54	8 29	9 53	11 13	12 31
52	8 31	9 53	11 11	12 26
50	8 33	9 52	11 09	12 22
45	8 38	9 52	11 04	12 13
40	8 41	9 52	11 00	12 06
35	8 44	9 52	10 57	12 00
30	8 47	9 52	10 54	11 54
20	8 52	9 51	10 49	11 45
10	8 56	9 51	10 44	11 36
0	9 00	9 51	10 40	11 29
10	9 03	9 51	10 36	11 21
20	9 07	9 50	10 32	11 13
30	9 12	9 50	10 27	11 04
35	9 15	9 50	10 24	10 58
40	9 18	9 50	10 21	10 53
45	9 21	9 50	10 18	10 46
50	9 26	9 50	10 13	10 37
52	9 28	9 50	10 11	10 34
54	9 30	9 50	10 09	10 30
56	9 32	9 50	10 07	10 25
58	9 34	9 50	10 04	10 20
60	9 37	9 50	10 02	10 14

Moonset	11	12	13	14
	h m	h m	h m	h m
N 72	21 53	21 37	21 20	20 59
70	21 50	21 41	21 31	21 20
68	21 48	21 44	21 41	21 37
66	21 46	21 47	21 48	21 50
64	21 44	21 49	21 55	22 01
62	21 42	21 51	22 01	22 11
60	21 41	21 53	22 06	22 19
58	21 40	21 55	22 10	22 26
56	21 39	21 56	22 14	22 33
54	21 38	21 57	22 17	22 39
52	21 37	21 59	22 21	22 44
50	21 36	22 00	22 24	22 49
45	21 34	22 02	22 30	22 59
40	21 33	22 04	22 35	23 07
35	21 31	22 06	22 40	23 15
30	21 30	22 07	22 44	23 21
20	21 28	22 10	22 51	23 33
10	21 26	22 12	22 58	23 43
0	21 24	22 14	23 03	23 52
10	21 22	22 17	23 09	24 01
20	21 20	22 19	23 16	24 11
30	21 18	22 21	23 23	24 23
35	21 17	22 23	23 27	24 29
40	21 15	22 25	23 32	24 37
45	21 13	22 27	23 37	24 46
50	21 11	22 29	23 44	24 57
52	21 10	22 30	23 47	25 01
54	21 09	22 31	23 50	25 07
56	21 08	22 32	23 54	25 13
58	21 06	22 34	23 58	25 20
60	21 05	22 36	24 03	0 03

GMT	Equation of Time (App. − Mean) 11	12	13
h	m s	m s	m s
0	− 5 18.7	− 5 26.7	− 5 34.3
6	− 5 20.7	− 5 28.6	− 5 36.1
12	− 5 22.7	− 5 30.5	− 5 37.8
18	− 5 24.7	− 5 32.4	− 5 39.6
24	− 5 26.7	− 5 34.3	− 5 41.3

GMT of Transit Meridian of Greenwich	DAY	Moon	Venus	Mars	Jupiter	Saturn
		h m	h m	h m	h m	h m
	11	15 12	10 12	4 06	14 55	20 20
	12	16 03	10 08	4 04	14 51	20 16
	13	16 52	10 04	4 01	14 48	20 12
	14	17 40	10 00	3 58	14 45	20 08

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.1	0.4	0.3
30	0.1	0.3	0.2
45	0.1	0.3	0.2
60	0.1	0.2	0.1
75	0.1	0.1	0.0
90			

Moon's Lower Limb Add

Alt. °	11 ′	12 ′	13 ′
0	19.4	18.2	17.1
4	19.4	18.2	17.1
8	19.3	18.2	17.1
12	19.3	18.2	17.0
16	19.2	18.1	17.0
20	19.2	18.1	17.0
24	19.1	18.0	17.0
28	19.0	17.9	16.9
32	18.9	17.9	16.9
36	18.7	17.8	16.8
40	18.6	17.7	16.8
44	18.5	17.6	16.7
48	18.3	17.5	16.6
52	18.1	17.4	16.6
56	18.0	17.2	16.5
60	17.8	17.1	16.4
64	17.6	17.0	16.4
68	17.4	16.8	16.3
72	17.2	16.7	16.2
76	17.0	16.6	16.1
80	16.8	16.4	16.0
84	16.6	16.3	16.0
88	16.4	16.2	15.9
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt. °	11 ′	12 ′	13 ′
0	13.4	14.0	14.7
4	13.4	14.0	14.7
8	13.4	14.1	14.7
12	13.5	14.1	14.7
16	13.5	14.1	14.7
20	13.6	14.2	14.8
24	13.7	14.2	14.8
28	13.8	14.3	14.8
32	13.9	14.4	14.9
36	14.0	14.5	14.9
40	14.1	14.6	15.0
44	14.3	14.7	15.0
48	14.4	14.8	15.1
52	14.6	14.9	15.2
56	14.8	15.0	15.2
60	15.0	15.1	15.3
64	15.1	15.3	15.4
68	15.3	15.4	15.5
72	15.5	15.5	15.5
76	15.7	15.7	15.6
80	15.9	15.8	15.7
84	16.2	16.0	15.8
88	16.3	16.1	15.9
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −4.1 GHA	Dec	MARS −1.3 GHA	Dec	JUPITER −1.3 GHA	Dec	SATURN 0.6 GHA	Dec	MOON GHA	code	Dec	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
14 0	291 50.1	209 41.0	+17 59.6	300 17.8	− 8 42.0	138 17.5	+11 58.7	57 14.6	−17 18.9	103 33.5	116	− 8 15.4	−116
1	306 52.5	224 43.5	59.5	315 19.4	41.8	153 19.5	58.5	72 17.2	18.9	118 04.1	117	8 27.0	−117
2	321 55.0	239 45.9	59.4	330 21.1	41.6	168 21.5	58.3	87 19.7	18.8	132 34.8	116	8 38.7	−115
3	336 57.5	254 48.3	.. 59.3	345 22.7	.. 41.3	183 23.5	.. 58.1	102 22.2	.. 18.8	147 05.4	117	· 8 50.2	−115
4	351 59.9	269 50.8	59.2	0 24.4	41.1	198 25.5	58.0	117 24.8	18.8	161 36.1	117	9 01.7	−115
5	7 02.4	284 53.2	59.0	15 26.1	40.9	213 27.5	57.8	132 27.3	18.8	176 06.8	117	9 13.2	−114
6	22 04.8	299 55.6	+17 58.9	30 27.7	− 8 40.7	228 29.5	+11 57.6	147 29.8	−17 18.8	190 37.5	117	− 9 24.6	−113
7	37 07.3	314 58.0	58.8	45 29.4	40.5	243 31.6	57.5	162 32.4	18.8	205 08.2	117	9 35.9	−112
8	52 09.8	330 00.5	58.7	60 31.1	40.3	258 33.6	57.3	177 34.9	18.8	219 38.9	117	9 47.1	−112
9	67 12.2	345 02.9	.. 58.6	75 32.7	.. 40.1	273 35.6	.. 57.1	192 37.4	.. 18.8	234 09.6	117	· 9 58.3	−112
10	82 14.7	0 05.3	58.5	90 34.4	39.9	288 37.6	56.9	207 40.0	18.8	248 40.3	117	10 09.5	−110
11	97 17.2	15 07.7	58.4	105 36.1	39.7	303 39.6	56.8	222 42.5	18.8	263 11.0	117	10 20.5	−110
12	112 19.6	30 10.1	+17 58.3	120 37.7	− 8 39.5	318 41.6	+11 56.6	237 45.0	−17 18.8	277 41.7	118	−10 31.5	−109
13	127 22.1	45 12.5	58.2	135 39.4	39.3	333 43.6	56.4	252 47.6	18.8	292 12.5	117	10 42.4	−109
14	142 24.6	60 14.9	58.1	150 41.1	39.1	348 45.6	56.3	267 50.1	18.8	306 43.2	117	10 53.3	−108
15	157 27.0	75 17.3	.. 58.0	165 42.7	.. 38.9	3 47.7	.. 56.1	282 52.6	.. 18.8	321 13.9	117	·11 04.1	−107
16	172 29.5	90 19.6	57.9	180 44.4	38.7	18 49.7	55.9	297 55.2	18.8	335 44.6	118	11 14.8	−107
17	187 32.0	105 22.0	57.8	195 46.1	38.5	33 51.7	55.8	312 57.7	18.8	350 15.4	117	11 25.5	−106
18	202 34.4	120 24.4	+17 57.7	210 47.7	− 8 38.3	48 53.7	+11 55.6	328 00.2	−17 18.8	4 46.1	117	−11 36.1	−105
19	217 36.9	135 26.8	57.6	225 49.4	38.1	63 55.7	55.4	343 02.8	18.8	19 16.8	117	11 46.6	−104
20	232 39.3	150 29.1	57.5	240 51.1	37.9	78 57.7	55.2	358 05.3	18.7	33 47.5	117	11 57.0	−104
21	247 41.8	165 31.5	.. 57.4	255 52.8	.. 37.7	93 59.7	.. 55.1	13 07.8	.. 18.7	48 18.2	118	·12 07.4	−103
22	262 44.3	180 33.9	57.3	270 54.5	37.5	109 01.7	54.9	28 10.3	18.7	62 49.0	117	12 17.7	−102
23	277 46.7	195 36.2	57.2	285 56.1	37.3	124 03.7	54.7	43 12.9	18.7	77 19.7	117	12 27.9	−102
15 0	292 49.2	210 38.6	+17 57.1	300 57.8	− 8 37.1	139 05.8	+11 54.6	58 15.4	−17 18.7	91 50.4	117	−12 38.1	−101
1	307 51.7	225 40.9	57.0	315 59.5	36.9	154 07.8	54.4	73 17.9	18.7	106 21.1	117	12 48.2	−100
2	322 54.1	240 43.3	57.0	331 01.2	36.7	169 09.8	54.2	88 20.5	18.7	120 51.8	117	12 58.2	− 99
3	337 56.6	255 45.6	.. 56.9	346 02.8	.. 36.5	184 11.8	.. 54.0	103 23.0	.. 18.7	135 22.5	117	·13 08.1	− 99
4	352 59.1	270 47.9	56.8	1 04.5	36.3	199 13.8	53.9	118 25.5	18.7	149 53.2	117	13 18.0	− 97
5	8 01.5	285 50.3	56.7	16 06.2	36.1	214 15.8	53.7	133 28.1	18.7	164 23.9	117	13 27.7	− 97
6	23 04.0	300 52.6	+17 56.6	31 07.9	− 8 36.0	229 17.8	+11 53.5	148 30.6	−17 18.7	178 54.6	117	−13 37.4	− 96
7	38 06.5	315 54.9	56.5	46 09.6	35.8	244 19.8	53.4	163 33.1	18.7	193 25.3	116	13 47.0	− 96
8	53 08.9	330 57.2	56.4	61 11.3	35.6	259 21.8	53.2	178 35.6	18.7	207 55.9	117	13 56.6	− 94
9	68 11.4	345 59.5	.. 56.4	76 13.0	.. 35.4	274 23.9	.. 53.0	193 38.2	.. 18.7	222 26.6	116	·14 06.0	− 94
10	83 13.8	1 01.8	56.3	91 14.6	35.2	289 25.9	52.8	208 40.7	18.7	236 57.2	117	14 15.4	− 93
11	98 16.3	16 04.1	56.2	106 16.3	35.0	304 27.9	52.7	223 43.2	18.7	251 27.9	116	14 24.7	− 92
12	113 18.8	31 06.4	+17 56.1	121 18.0	− 8 34.8	319 29.9	+11 52.5	238 45.8	−17 18.7	265 58.5	117	−14 33.9	− 92
13	128 21.2	46 08.7	56.0	136 19.7	34.6	334 31.9	52.3	253 48.3	18.7	280 29.2	116	14 43.1	− 90
14	143 23.7	61 11.0	56.0	151 21.4	34.4	349 33.9	52.2	268 50.8	18.7	294 59.8	116	14 52.1	− 90
15	158 26.2	76 13.3	.. 55.9	166 23.1	.. 34.2	4 35.9	.. 52.0	283 53.3	.. 18.7	309 30.4	116	·15 01.1	− 89
16	173 28.6	91 15.6	55.8	181 24.8	34.0	19 37.9	51.8	298 55.9	18.7	324 01.0	116	15 10.0	− 88
17	188 31.1	106 17.9	55.7	196 26.5	33.8	34 39.9	51.6	313 58.4	18.7	338 31.6	116	15 18.8	− 87
18	203 33.6	121 20.2	+17 55.7	211 28.2	− 8 33.6	49 41.9	+11 51.5	329 00.9	−17 18.6	353 02.2	116	−15 27.5	− 86
19	218 36.0	136 22.4	55.6	226 29.9	33.5	64 43.9	51.3	344 03.4	18.6	7 32.8	115	15 36.1	− 85
20	233 38.5	151 24.7	55.5	241 31.6	33.3	79 46.0	51.1	359 06.0	18.6	22 03.3	116	15 44.6	− 85
21	248 40.9	166 27.0	.. 55.4	256 33.3	.. 33.1	94 48.0	.. 50.9	14 08.5	.. 18.6	36 33.9	115	·15 53.1	− 84
22	263 43.4	181 29.2	55.4	271 35.0	32.9	109 50.0	50.8	29 11.0	18.6	51 04.4	116	16 01.5	− 83
23	278 45.9	196 31.5	55.3	286 36.7	32.7	124 52.0	50.6	44 13.6	18.6	65 35.0	115	16 09.8	− 82
16 0	293 48.3	211 33.8	+17 55.2	301 38.4	− 8 32.5	139 54.0	+11 50.4	59 16.1	−17 18.6	80 05.5	115	−16 18.0	− 81
1	308 50.8	226 36.0	55.2	316 40.1	32.3	154 56.0	50.3	74 18.6	18.6	94 36.0	115	16 26.1	− 80
2	323 53.3	241 38.3	55.1	331 41.8	32.1	169 58.0	50.1	89 21.1	18.6	109 06.5	115	16 34.1	− 79
3	338 55.7	256 40.5	.. 55.0	346 43.5	.. 31.9	185 00.0	.. 49.9	104 23.7	.. 18.6	123 37.0	114	·16 42.0	− 79
4	353 58.2	271 42.7	55.0	1 45.2	31.8	200 02.0	49.7	119 26.2	18.6	138 07.4	115	16 49.9	− 77
5	9 00.7	286 45.0	54.9	16 46.9	31.6	215 04.0	49.6	134 28.7	18.6	152 37.9	115	16 57.6	− 77
6	24 03.1	301 47.2	+17 54.8	31 48.6	− 8 31.4	230 06.0	+11 49.4	149 31.2	−17 18.6	167 08.4	114	−17 05.3	− 75
7	39 05.6	316 49.4	54.8	46 50.3	31.2	245 08.1	49.2	164 33.8	18.6	181 38.8	114	17 12.8	− 75
8	54 08.1	331 51.6	54.7	61 52.0	31.0	260 10.1	49.1	179 36.3	18.6	196 09.2	114	17 20.3	− 74
9	69 10.5	346 53.9	.. 54.7	76 53.7	.. 30.8	275 12.1	.. 48.9	194 38.8	.. 18.6	210 39.6	114	·17 27.7	− 73
10	84 13.0	1 56.1	54.6	91 55.4	30.6	290 14.1	48.7	209 41.3	18.6	225 10.0	114	17 35.0	− 72
11	99 15.4	16 58.3	54.5	106 57.1	30.5	305 16.1	48.5	224 43.9	18.6	239 40.4	114	17 42.2	− 71
12	114 17.9	32 00.5	+17 54.5	121 58.8	− 8 30.3	320 18.1	+11 48.4	239 46.4	−17 18.6	254 10.8	114	−17 49.3	− 70
13	129 20.4	47 02.7	54.4	137 00.6	30.1	335 20.1	48.2	254 48.9	18.6	268 41.2	113	17 56.3	− 69
14	144 22.8	62 04.9	54.4	152 02.3	29.9	350 22.1	48.0	269 51.4	18.6	283 11.5	114	18 03.2	− 68
15	159 25.3	77 07.1	.. 54.3	167 04.0	.. 29.7	5 24.1	.. 47.8	284 54.0	.. 18.6	297 41.9	113	·18 10.0	− 68
16	174 27.8	92 09.3	54.3	182 05.7	29.5	20 26.1	47.7	299 56.5	18.6	312 12.2	113	18 16.8	− 66
17	189 30.2	107 11.5	54.2	197 07.4	29.4	35 28.1	47.5	314 59.0	18.6	326 42.5	113	18 23.4	− 65
18	204 32.7	122 13.7	+17 54.2	212 09.1	− 8 29.2	50 30.1	+11 47.3	330 01.5	−17 18.6	341 12.8	113	−18 29.9	− 65
19	219 35.2	137 15.8	54.1	227 10.9	29.0	65 32.1	47.1	345 04.0	18.6	355 43.1	113	18 36.4	− 63
20	234 37.6	152 18.0	54.1	242 12.6	28.8	80 34.1	47.0	0 06.6	18.6	10 13.4	112	18 42.7	− 63
21	249 40.1	167 20.2	.. 54.0	257 14.3	.. 28.6	95 36.2	.. 46.8	15 09.1	.. 18.5	24 43.6	113	·18 49.0	− 61
22	264 42.6	182 22.3	54.0	272 16.0	28.5	110 38.2	46.6	30 11.6	18.5	39 13.9	112	18 55.1	− 61
23	279 45.0	197 24.5	53.9	287 17.7	28.3	125 40.2	46.5	45 14.1	18.5	53 44.1	113	19 01.2	− 59
24	294 47.5	212 26.7	+17 53.9	302 19.5	− 8 28.1	140 42.2	+11 46.3	60 16.7	−17 18.5	68 14.4	112	−19 07.1	− 59
code	−	+ 23	− 1	+ 17	+ 2	+ 20	− 2	+ 25	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
14 0	178 34.6	+21 43.4	7	Acamar	315 50.8	−40 28.4
1	193 34.6	43.0	5	Achernar	335 58.5	−57 27.0
2	208 34.5	42.6	30	Acrux	173 57.2	−62 51.9
3	223 34.4	·· 42.2	19	Adhara	255 46.4	−28 54.7
4	238 34.4	41.9	10	Aldebaran	291 38.6	+16 25.4
5	253 34.3	41.5				
6	268 34.2	+21 41.1	32	Alioth	166 58.1	+56 11.9
7	283 34.1	40.7	34	Alkaid	153 32.4	+49 32.0
8	298 34.1	40.4	55	Al Na'ir	28 36.8	−47 10.0
9	313 34.0	·· 40.0	15	Alnilam	276 29.9	− 1 13.7
10	328 33.9	39.6	25	Alphard	218 38.3	− 8 28.3
11	343 33.9	39.2				
12	358 33.8	+21 38.8	41	Alphecca	126 46.9	+26 51.8
13	13 33.7	38.4	1	Alpheratz	358 27.5	+28 51.0
14	28 33.7	38.1	51	Altair	62 49.5	+ 8 45.3
15	43 33.6	·· 37.7	2	Ankaa	353 57.6	−42 32.1
16	58 33.5	37.3	42	Antares	113 18.3	−26 20.3
17	73 33.5	36.9				
18	88 33.4	+21 36.5	37	Arcturus	146 34.6	+19 24.6
19	103 33.3	36.1	43	Atria	108 58.0	−68 57.2
20	118 33.3	35.7	22	Avior	234 36.1	−59 22.3
21	133 33.2	·· 35.4	13	Bellatrix	279 18.1	+ 6 18.7
22	148 33.1	35.0	16	Betelg'se	271 47.8	+ 7 24.0
23	163 33.1	34.6				
			17	Canopus	264 15.6	− 52 40.2
15 0	178 33.0	+21 34.2	12	Capella	281 37.9	+45 57.2
1	193 32.9	33.8	53	Deneb	50 00.1	+45 07.5
2	208 32.9	33.4	28	Denebola	183 17.3	+14 48.9
3	223 32.8	·· 33.0	4	Diphda	349 38.6	− 18 13.2
4	238 32.7	32.6				
5	253 32.7	32.2	27	Dubhe	194 44.3	+61 59.3
6	268 32.6	+21 31.8	14	Elnath	279 06.9	+28 34.3
7	283 32.5	31.4	47	Eltanin	91 05.5	+51 29.8
8	298 32.5	31.1	54	Enif	34 28.7	+ 9 40.6
9	313 32.4	·· 30.7	56	Fomalhaut	16 10.7	−29 50.9
10	328 32.4	30.3				
11	343 32.3	29.9	31	Gacrux	172 48.6	− 56 52.5
12	358 32.2	+21 29.5	29	Gienah	176 36.3	− 17 18.2
13	13 32.2	29.1	35	Hadar	149 48.4	− 60 10.2
14	28 32.1	28.7	6	Hamal	328 49.0	+ 23 15.4
15	43 32.0	·· 28.3	48	Kaus Aust.	84 40.0	− 34 24.4
16	58 32.0	27.9				
17	73 31.9	27.5	40	Kochab	137 17.6	+74 20.3
18	88 31.9	+21 27.1	57	Markab	14 20.6	+14 58.4
19	103 31.8	26.7	8	Menkar	314 59.8	+ 3 55.3
20	118 31.7	26.3	36	Menkent	148 57.9	− 36 09.6
21	133 31.7	·· 25.9	24	Miapl'dus	221 49.7	− 69 32.5
22	148 31.6	25.5				
23	163 31.6	25.1	9	Mirfak	309 41.7	+49 42.3
			50	Nunki	76 50.8	− 26 21.0
16 0	178 31.5	+21 24.7	52	Peacock	54 25.7	− 56 52.4
1	193 31.4	24.2	21	Pollux	244 20.2	+28 07.9
2	208 31.4	23.8	20	Procyon	245 44.7	+ 5 20.2
3	223 31.3	·· 23.4				
4	238 31.3	23.0	46	R'alhague	96 45.7	+12 35.6
5	253 31.2	22.6	26	Regulus	208 29.1	+12 10.8
6	268 31.1	+21 22.2	11	Rigel	281 53.3	− 8 15.0
7	283 31.1	21.8	38	Rigil Kent.	140 49.9	− 60 39.8
8	298 31.0	21.4	44	Sabik	103 01.2	− 15 40.3
9	313 31.0	·· 21.0				
10	328 30.9	20.6	3	Schedar	350 29.1	+56 17.8
11	343 30.8	20.2	45	Shaula	97 19.5	− 37 04.4
12	358 30.8	+21 19.7	18	Sirius	259 11.7	− 16 39.3
13	13 30.7	19.3	33	Spica	159 16.2	− 10 56.2
14	28 30.7	18.9	23	Suhail	223 24.3	− 43 15.6
15	43 30.6	·· 18.5				
16	58 30.6	18.1	49	Vega	81 07.4	+38 44.7
17	73 30.5	17.7	39	Zub'g'bi	137 52.6	− 15 51.8
18	88 30.5	+21 17.3				
19	103 30.4	16.8				
20	118 30.3	16.4				
21	133 30.3	·· 16.0				
22	148 30.2	15.6				
23	163 30.2	15.2				
24	178 30.1	+21 14.8				
code	—	− 4				

Lat.	Sunrise	Twlt. begins
N °	h m	h m
72	□	□
70	□	□
68	□	□
66	1 35	////
64	2 15	////
62	2 42	////
60	3 03	////
58	3 20	////
56	3 35	////
54	3 47	////
52	3 58	////
50	4 07	0 40
45	4 27	2 05
40	4 44	2 46
35	4 57	3 13
30	5 09	3 34
20	5 29	4 07
10	5 46	4 30
0	6 02	4 48
10	6 18	5 03
20	6 35	5 17
30	6 54	5 31
35	7 06	5 37
40	7 18	5 43
45	7 33	5 49
50	7 52	5 55
52	8 00	5 58
54	8 10	6 01
56	8 21	6 04
58	8 34	6 08
60	8 48	6 11
S		

Moonrise	14	15	16	17
	h m	h m	h m	h m
N 72	14 01	16 14	▬	▬
70	13 41	15 37	17 44	▬
68	13 26	15 11	16 57	18 44
66	13 14	14 51	16 26	17 56
64	13 04	14 35	16 03	17 25
62	12 55	14 22	15 45	17 02
60	12 48	14 11	15 30	16 43
58	12 42	14 02	15 18	16 28
56	12 36	13 53	15 07	16 15
54	12 31	13 46	14 57	16 04
52	12 26	13 39	14 49	15 54
50	12 22	13 33	14 41	15 45
45	12 13	13 21	14 25	15 26
40	12 06	13 10	14 12	15 11
35	12 00	13 01	14 01	14 58
30	11 54	12 53	13 51	14 47
20	11 45	12 40	13 34	14 27
10	11 36	12 28	13 19	14 11
0	11 29	12 17	13 06	13 55
10	11 21	12 06	12 52	13 40
20	11 13	11 55	12 38	13 23
30	11 04	11 42	12 22	13 04
35	10 58	11 34	12 12	12 53
40	10 53	11 26	12 01	12 41
45	10 46	11 16	11 49	12 26
50	10 37	11 04	11 33	12 08
52	10 34	10 58	11 26	12 00
54	10 30	10 52	11 18	11 50
56	10 25	10 45	11 09	11 39
58	10 20	10 38	10 59	11 27
60	10 14	10 29	10 48	11 13

Lat.	Sunset	Twlt. ends
N °	h m	h m
72	□	□
70	□	□
68	□	□
66	22 33	////
64	21 54	////
62	21 28	////
60	21 07	////
58	20 50	////
56	20 36	////
54	20 24	////
52	20 13	////
50	20 04	23 24
45	19 44	22 04
40	19 28	21 25
35	19 14	20 57
30	19 03	20 37
20	18 43	20 05
10	18 25	19 41
0	18 10	19 24
10	17 54	19 08
20	17 37	18 55
30	17 18	18 42
35	17 07	18 36
40	16 54	18 30
45	16 39	18 24
50	16 21	18 18
52	16 12	18 15
54	16 02	18 11
56	15 52	18 09
58	15 39	18 06
60	15 24	18 02
S		

Moonset	14	15	16	17
	h m	h m	h m	h m
N 72	20 59	20 27	▬	▬
70	21 20	21 06	20 41	▬
68	21 37	21 33	21 29	21 25
66	21 50	21 53	22 00	22 13
64	22 01	22 10	22 23	22 44
62	22 11	22 24	22 42	23 08
60	22 19	22 36	22 57	23 26
58	22 26	22 46	23 10	23 42
56	22 33	22 55	23 22	23 55
54	22 39	23 03	23 32	24 07
52	22 44	23 10	23 40	24 17
50	22 49	23 16	23 48	24 26
45	22 59	23 30	24 05	0 05
40	23 07	23 42	24 19	0 19
35	23 15	23 52	24 31	0 31
30	23 21	24 00	0 00	0 42
20	23 33	24 15	0 15	0 59
10	23 43	24 28	0 28	1 15
0	23 52	24 40	0 40	1 30
10	24 01	0 01	0 53	1 44
20	24 11	0 11	1 06	2 00
30	24 23	0 23	1 21	2 18
35	24 29	0 29	1 30	2 28
40	24 37	0 37	1 40	2 40
45	24 46	0 46	1 52	2 55
50	24 57	0 57	2 06	3 12
52	25 01	1 01	2 13	3 20
54	25 07	1 07	2 20	3 29
56	25 13	1 13	2 29	3 40
58	25 20	1 20	2 38	3 52
60	0 03	1 28	2 49	4 05

GMT	Equation of Time (App. − Mean) 14	15	16
h	m s	m s	m s
0	− 5 41.3	− 5 47.9	− 5 53.9
6	− 5 43.0	− 5 49.4	− 5 55.3
12	− 5 44.7	− 5 51.0	− 5 56.7
18	− 5 46.3	− 5 52.5	− 5 58.1
24	− 5 47.9	− 5 53.9	− 5 59.4

GMT of Transit Meridian of Greenwich	DAY	Moon	Venus	Mars	Jupiter	Saturn
		h m	h m	h m	h m	h m
	14	17 40	10 00	3 58	14 45	20 08
	15	18 29	9 56	3 56	14 42	20 04
	16	19 18	9 52	3 53	14 38	20 00
	17	20 07	9 49	3 50	14 35	19 56

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.1	0.4	0.3
30	0.1	0.3	0.2
45	0.1	0.2	0.2
60	0.1	0.2	0.1
75	0.1	0.1	0.0
90			

Moon's Lower Limb Add

Alt.	14	15	16
°	′	′	′
0	15.9	14.9	14.0
4	15.9	14.9	14.0
8	15.9	14.9	14.0
12	15.9	14.9	14.1
16	15.9	14.9	14.1
20	15.9	15.0	14.1
24	15.9	15.0	14.1
28	15.9	15.0	14.2
32	15.9	15.0	14.2
36	15.9	15.0	14.3
40	15.9	15.0	14.3
44	15.8	15.1	14.4
48	15.8	15.1	14.5
52	15.8	15.1	14.5
56	15.8	15.1	14.6
60	15.8	15.2	14.7
64	15.8	15.2	14.7
68	15.7	15.2	14.8
72	15.7	15.3	14.9
76	15.7	15.3	15.0
80	15.7	15.3	15.1
84	15.7	15.4	15.1
88	15.6	15.4	15.2
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	14	15	16
°	′	′	′
0	15.3	15.9	16.4
4	15.3	15.9	16.4
8	15.3	15.9	16.4
12	15.3	15.9	16.4
16	15.3	15.9	16.4
20	15.4	15.9	16.3
24	15.4	15.9	16.3
28	15.4	15.8	16.3
32	15.4	15.8	16.2
36	15.4	15.8	16.2
40	15.4	15.8	16.1
44	15.4	15.8	16.1
48	15.4	15.7	16.0
52	15.5	15.7	15.9
56	15.5	15.7	15.9
60	15.5	15.6	15.8
64	15.5	15.6	15.7
68	15.5	15.6	15.6
72	15.5	15.6	15.6
76	15.6	15.5	15.5
80	15.6	15.5	15.4
84	15.6	15.4	15.3
88	15.6	15.4	15.2
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −4.1 GHA	Dec.	MARS −1.4 GHA	Dec.	JUPITER −1.3 GHA	Dec.	SATURN 0.6 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
17 0	294 47.5	212 26.7	+17 53.9	302 19.5	− 8 28.1	140 42.2	+11 46.3	60 16.7	−17 18.5	68 14.4	112	−19 07.1	− 59
1	309 49.9	227 28.8	53.8	317 21.2	27.9	155 44.2	46.1	75 19.2	18.5	82 44.6	112	19 13.0	− 57
2	324 52.4	242 31.0	53.8	332 22.9	27.7	170 46.2	45.9	90 21.7	18.5	97 14.8	112	19 18.7	− 57
3	339 54.9	257 33.1	·· 53.7	347 24.6	·· 27.6	185 48.2	·· 45.8	105 24.2	·· 18.5	111 45.0	112	·19 24.4	− 56
4	354 57.3	272 35.3	53.7	2 26.4	27.4	200 50.2	45.6	120 26.7	18.5	126 15.2	112	19 30.0	− 54
5	9 59.8	287 37.4	53.7	17 28.1	27.2	215 52.2	45.4	135 29.3	18.5	140 45.4	111	19 35.4	− 54
6	25 02.3	302 39.5	+17 53.6	32 29.8	− 8 27.0	230 54.2	+11 45.2	150 31.8	−17 18.5	155 15.5	112	−19 40.8	− 52
7	40 04.7	317 41.7	53.6	47 31.5	26.8	245 56.2	45.1	165 34.3	18.5	169 45.7	111	19 46.0	− 52
8	55 07.2	332 43.8	53.5	62 33.3	26.7	260 58.2	44.9	180 36.8	18.5	184 15.8	112	19 51.2	− 50
9	70 09.7	347 45.9	·· 53.5	77 35.0	·· 26.5	276 00.2	·· 44.7	195 39.4	·· 18.5	198 46.0	111	·19 56.2	− 50
10	85 12.1	2 48.0	53.5	92 36.7	26.3	291 02.2	44.5	210 41.9	18.5	213 16.1	111	20 01.2	− 49
11	100 14.6	17 50.2	53.4	107 38.5	26.1	306 04.2	44.4	225 44.4	18.5	227 46.2	111	20 06.1	− 47
12	115 17.1	32 52.3	+17 53.4	122 40.2	− 8 26.0	321 06.2	+11 44.2	240 46.9	−17 18.5	242 16.3	111	−20 10.8	− 47
13	130 19.5	47 54.4	53.4	137 41.9	25.8	336 08.3	44.0	255 49.4	18.5	256 46.4	111	20 15.5	− 45
14	145 22.0	62 56.5	53.3	152 43.7	25.6	351 10.3	43.8	270 52.0	18.5	271 16.5	111	20 20.0	− 45
15	160 24.4	77 58.6	·· 53.3	167 45.4	·· 25.4	6 12.3	·· 43.7	285 54.5	·· 18.5	285 46.6	110	·20 24.5	− 43
16	175 26.9	93 00.7	53.3	182 47.1	25.3	21 14.3	43.5	300 57.0	18.5	300 16.6	111	20 28.8	− 42
17	190 29.4	108 02.8	53.2	197 48.9	25.1	36 16.3	43.3	315 59.5	18.5	314 46.7	111	20 33.0	− 42
18	205 31.8	123 04.9	+17 53.2	212 50.6	− 8 24.9	51 18.3	+11 43.2	331 02.0	−17 18.5	329 16.8	110	−20 37.2	− 40
19	220 34.3	138 07.0	53.2	227 52.4	24.8	66 20.3	43.0	346 04.6	18.5	343 46.8	111	20 41.2	− 39
20	235 36.8	153 09.0	53.1	242 54.1	24.6	81 22.3	42.8	1 07.1	18.5	358 16.9	110	20 45.1	− 39
21	250 39.2	168 11.1	·· 53.1	257 55.8	·· 24.4	96 24.3	·· 42.6	16 09.6	·· 18.5	12 46.9	110	·20 49.0	− 37
22	265 41.7	183 13.2	53.1	272 57.6	24.2	111 26.3	42.5	31 12.1	18.5	27 16.9	111	20 52.7	− 36
23	280 44.2	198 15.3	53.1	287 59.3	24.1	126 28.3	42.3	46 14.6	18.5	41 47.0	110	20 56.3	− 35
18 0	295 46.6	213 17.3	+17 53.0	303 01.1	− 8 23.9	141 30.3	+11 42.1	61 17.1	−17 18.5	56 17.0	110	−20 59.8	− 34
1	310 49.1	228 19.4	53.0	318 02.8	23.7	156 32.3	41.9	76 19.7	18.5	70 47.0	110	21 03.2	− 33
2	325 51.5	243 21.5	53.0	333 04.6	23.6	171 34.3	41.8	91 22.2	18.5	85 17.0	110	21 06.5	− 33
3	340 54.0	258 23.5	·· 53.0	348 06.3	·· 23.4	186 36.3	·· 41.6	106 24.7	·· 18.5	99 47.0	111	·21 09.8	− 30
4	355 56.5	273 25.6	52.9	3 08.1	23.2	201 38.3	41.4	121 27.2	18.5	114 17.1	110	21 12.8	− 30
5	10 58.9	288 27.6	52.9	18 09.8	23.1	216 40.3	41.2	136 29.7	18.5	128 47.1	110	21 15.8	− 29
6	26 01.4	303 29.6	+17 52.9	33 11.6	− 8 22.9	231 42.3	+11 41.1	151 32.3	−17 18.5	143 17.1	110	−21 18.7	− 28
7	41 03.9	318 31.7	52.9	48 13.3	22.7	246 44.3	40.9	166 34.8	18.5	157 47.1	110	21 21.5	− 27
8	56 06.3	333 33.7	52.9	63 15.1	22.5	261 46.3	40.7	181 37.3	18.5	172 17.1	110	21 24.2	− 26
9	71 08.8	348 35.8	·· 52.8	78 16.8	·· 22.4	276 48.3	·· 40.5	196 39.8	·· 18.5	186 47.1	110	·21 26.8	− 24
10	86 11.3	3 37.8	52.8	93 18.6	22.2	291 50.3	40.4	211 42.3	18.5	201 17.1	110	21 29.2	− 24
11	101 13.7	18 39.8	52.8	108 20.3	22.0	306 52.4	40.2	226 44.8	18.5	215 47.1	110	21 31.6	− 22
12	116 16.2	33 41.8	+17 52.8	123 22.1	− 8 21.9	321 54.4	+11 40.0	241 47.3	−17 18.5	230 17.1	110	−21 33.8	− 22
13	131 18.7	48 43.8	52.8	138 23.9	21.7	336 56.4	39.8	256 49.9	18.5	244 47.1	110	21 36.0	− 20
14	146 21.1	63 45.9	52.8	153 25.6	21.6	351 58.4	39.7	271 52.4	18.5	259 17.1	110	21 38.0	− 20
15	161 23.6	78 47.9	·· 52.8	168 27.4	·· 21.4	7 00.4	·· 39.5	286 54.9	·· 18.5	273 47.1	110	·21 40.0	− 18
16	176 26.0	93 49.9	52.7	183 29.1	21.2	22 02.4	39.3	301 57.4	18.4	288 17.1	110	21 41.8	− 17
17	191 28.5	108 51.9	52.7	198 30.9	21.1	37 04.4	39.1	316 59.9	18.4	302 47.1	110	21 43.5	− 16
18	206 31.0	123 53.9	+17 52.7	213 32.7	− 8 20.9	52 06.4	+11 39.0	332 02.4	−17 18.4	317 17.1	110	−21 45.1	− 15
19	221 33.4	138 55.9	52.7	228 34.4	20.7	67 08.4	38.8	347 05.0	18.4	331 47.1	111	21 46.6	− 15
20	236 35.9	153 57.9	52.7	243 36.2	20.6	82 10.4	38.6	2 07.5	18.4	346 17.2	110	21 48.1	− 13
21	251 38.4	168 59.9	·· 52.7	258 38.0	·· 20.4	97 12.4	·· 38.4	17 10.0	·· 18.4	0 47.2	110	·21 49.4	− 11
22	266 40.8	184 01.8	52.7	273 39.7	20.2	112 14.4	38.3	32 12.5	18.4	15 17.2	111	21 50.5	− 11
23	281 43.3	199 03.8	52.7	288 41.5	20.1	127 16.4	38.1	47 15.0	18.4	29 47.3	110	21 51.6	− 10
19 0	296 45.8	214 05.8	+17 52.7	303 43.3	− 8 19.9	142 18.4	+11 37.9	62 17.5	−17 18.4	44 17.3	111	−21 52.6	− 9
1	311 48.2	229 07.8	52.7	318 45.0	19.8	157 20.4	37.7	77 20.0	18.4	58 47.4	111	21 53.5	− 8
2	326 50.7	244 09.7	52.7	333 46.8	19.6	172 22.4	37.6	92 22.6	18.4	73 17.5	110	21 54.3	− 6
3	341 53.1	259 11.7	·· 52.7	348 48.6	·· 19.4	187 24.4	·· 37.4	107 25.1	·· 18.4	87 47.5	111	·21 54.9	− 6
4	356 55.6	274 13.7	52.7	3 50.3	19.3	202 26.4	37.2	122 27.6	18.4	102 17.6	111	21 55.5	− 5
5	11 58.1	289 15.6	52.7	18 52.1	19.1	217 28.4	37.0	137 30.1	18.4	116 47.7	111	21 56.0	− 3
6	27 00.5	304 17.6	+17 52.7	33 53.9	− 8 19.0	232 30.4	+11 36.8	152 32.6	−17 18.4	131 17.8	111	−21 56.3	− 2
7	42 03.0	319 19.5	52.7	48 55.7	18.8	247 32.4	36.7	167 35.1	18.4	145 47.9	112	21 56.5	− 2
8	57 05.5	334 21.5	52.7	63 57.4	18.6	262 34.4	36.5	182 37.6	18.4	160 18.1	111	21 56.7	0
9	72 07.9	349 23.4	·· 52.7	78 59.2	·· 18.5	277 36.4	·· 36.3	197 40.2	·· 18.4	174 48.2	111	·21 56.7	+ 1
10	87 10.4	4 25.4	52.7	94 01.0	18.3	292 38.4	36.1	212 42.7	18.4	189 18.3	112	21 56.6	+ 1
11	102 12.9	19 27.3	52.7	109 02.8	18.2	307 40.4	36.0	227 45.2	18.4	203 48.5	112	21 56.5	+ 3
12	117 15.3	34 29.2	+17 52.7	124 04.6	− 8 18.0	322 42.4	+11 35.8	242 47.7	−17 18.4	218 18.7	112	−21 56.2	+ 4
13	132 17.8	49 31.2	52.7	139 06.3	17.9	337 44.4	35.6	257 50.2	18.4	232 48.9	112	21 55.8	+ 5
14	147 20.3	64 33.1	52.7	154 08.1	17.7	352 46.4	35.4	272 52.7	18.4	247 19.1	112	21 55.3	+ 6
15	162 22.7	79 35.0	·· 52.7	169 09.9	·· 17.6	7 48.4	·· 35.3	287 55.2	·· 18.4	261 49.3	113	·21 54.7	+ 7
16	177 25.2	94 36.9	52.7	184 11.7	17.4	22 50.4	35.1	302 57.7	18.4	276 19.6	112	21 54.0	+ 8
17	192 27.6	109 38.8	52.7	199 13.5	17.2	37 52.4	34.9	318 00.3	18.4	290 49.8	113	21 53.2	+ 9
18	207 30.1	124 40.7	+17 52.7	214 15.3	− 8 17.1	52 54.4	+11 34.7	333 02.8	−17 18.4	305 20.1	113	−21 52.3	+ 10
19	222 32.6	139 42.6	52.7	229 17.0	16.9	67 56.4	34.6	348 05.3	18.4	319 50.4	113	21 51.3	+ 11
20	237 35.0	154 44.6	52.7	244 18.8	16.8	82 58.4	34.4	3 07.8	18.4	334 20.7	113	21 50.2	+ 12
21	252 37.5	169 46.5	·· 52.8	259 20.6	·· 16.6	98 00.4	·· 34.2	18 10.3	·· 18.4	348 51.0	114	·21 49.0	+ 14
22	267 40.0	184 48.3	52.8	274 22.4	16.5	113 02.4	34.0	33 12.8	18.4	3 21.4	114	21 47.6	+ 14
23	282 42.4	199 50.2	52.8	289 24.2	16.3	128 04.4	33.9	48 15.3	18.4	17 51.8	113	21 46.2	+ 15
24	297 44.9	214 52.1	+17 52.8	304 26.0	− 8 16.2	143 06.4	+11 33.7	63 17.8	−17 18.4	32 22.1	115	−21 44.7	+ 16
code	-	+ 20	0	+ 18	+ 2	+ 20	− 2	+ 26	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
17 0	178 30.1	+21 14.8	7	Acamar	315 50.8	−40 28.4
1	193 30.1	14.3	5	Achernar	335 58.4	−57 27.0
2	208 30.0	13.9	30	Acrux	173 57.3	−62 51.9
3	223 30.0	13.5	19	Adhara	255 46.4	−28 54.7
4	238 29.9	13.1	10	Aldebaran	291 38.6	+16 25.4
5	253 29.9	12.6				
6	268 29.8	+21 12.2	32	Alioth	166 58.2	+56 11.9
7	283 29.7	11.8	34	Alkaid	153 32.4	+49 32.0
8	298 29.7	11.4	55	Al Na'ir	28 36.8	−47 10.0
9	313 29.6	10.9	15	Alnilam	276 29.9	− 1 13.7
10	328 29.6	10.5	25	Alphard	218 38.3	− 8 28.3
11	343 29.5	10.1				
12	358 29.5	+21 09.7	41	Alphecca	126 46.9	+26 51.8
13	13 29.4	09.2	1	Alpheratz	358 27.5	+28 51.0
14	28 29.4	08.8	51	Altair	62 49.5	+ 8 45.3
15	43 29.3	08.4	2	Ankaa	353 57.6	−42 32.1
16	58 29.3	07.9	42	Antares	113 18.3	−26 20.3
17	73 29.2	07.5				
18	88 29.2	+21 07.1	37	Arcturus	146 34.6	+19 24.6
19	103 29.1	06.7	43	Atria	108 58.1	−68 57.2
20	118 29.1	06.2	22	Avior	234 36.1	−59 22.3
21	133 29.0	05.8	13	Bellatrix	279 18.0	+ 6 18.7
22	148 29.0	05.4	16	Betelg'se	271 47.8	+ 7 24.0
23	163 28.9	04.9				
			17	Canopus	264 15.6	−52 40.2
18 0	178 28.9	+21 04.5	12	Capella	281 37.9	+45 57.2
1	193 28.8	04.1	53	Deneb	50 00.1	+45 07.6
2	208 28.8	03.6	28	Denebola	183 17.3	+14 48.9
3	223 28.7	03.2	4	Diphda	349 38.6	−18 13.2
4	238 28.7	02.7				
5	253 28.6	02.3	27	Dubhe	194 44.3	+61 59.3
6	268 28.6	+21 01.9	14	Elnath	279 06.9	+28 34.3
7	283 28.5	01.4	47	Eltanin	91 05.5	+51 29.8
8	298 28.5	01.0	54	Enif	34 28.7	+ 9 40.7
9	313 28.5	00.5	56	Fomalhaut	16 10.7	−29 50.9
10	328 28.4	21 00.1				
11	343 28.4	20 59.7	31	Gacrux	172 48.7	−56 52.5
12	358 28.3	+20 59.2	29	Gienah	176 36.3	−17 18.2
13	13 28.3	58.8	35	Hadar	149 48.4	−60 10.2
14	28 28.2	58.3	6	Hamal	328 49.0	+23 15.5
15	43 28.2	57.9	48	Kaus Aust.	84 40.0	−34 24.4
16	58 28.1	57.4				
17	73 28.1	57.0	40	Kochab	137 17.7	+74 20.3
18	88 28.0	+20 56.6	57	Markab	14 20.6	+14 58.4
19	103 28.0	56.1	8	Menkar	314 59.8	+ 3 55.3
20	118 28.0	55.7	36	Menkent	148 57.9	−36 09.6
21	133 27.9	55.2	24	Miapl'dus	221 49.7	−69 32.5
22	148 27.9	54.8				
23	163 27.8	54.3	9	Mirfak	309 41.7	+49 42.3
			50	Nunki	76 50.8	−26 21.0
19 0	178 27.8	+20 53.9	52	Peacock	54 25.7	−56 52.4
1	193 27.7	53.4	21	Pollux	244 20.2	+28 07.9
2	208 27.7	53.0	20	Procyon	245 44.7	+ 5 20.2
3	223 27.7	52.5				
4	238 27.6	52.1	46	R'alhague	96 45.7	+12 35.6
5	253 27.6	51.6	26	Regulus	208 29.1	+12 10.8
6	268 27.5	+20 51.2	11	Rigel	281 53.3	− 8 15.0
7	283 27.5	50.7	38	Rigil Kent.	140 49.9	−60 39.8
8	298 27.4	50.2	44	Sabik	103 01.2	−15 40.3
9	313 27.4	49.8				
10	328 27.4	49.3	3	Schedar	350 29.1	+56 17.8
11	343 27.3	48.9	45	Shaula	97 19.5	−37 04.4
12	358 27.3	+20 48.4	18	Sirius	259 11.6	−16 39.3
13	13 27.2	48.0	33	Spica	159 16.2	−10 56.2
14	28 27.2	47.5	23	Suhail	223 24.3	−43 15.5
15	43 27.2	47.1				
16	58 27.1	46.6	49	Vega	81 07.4	+38 44.7
17	73 27.1	46.1	39	Zub'g'bi	137 52.6	−15 51.8
18	88 27.0	+20 45.7				
19	103 27.0	45.2				
20	118 27.0	44.8				
21	133 26.9	44.3				
22	148 26.9	43.8				
23	163 26.9	43.4				
24	178 26.8	+20 42.9				
code	—	− 4				

Lat.	Sunrise	Twlt. begins	Moonrise 17	18	19	20
N °	h m	h m	h m	h m	h m	h m
72	□	□	▬	▬	▬	▬
70	□	□	▬	▬	▬	▬
68	0 31	////	18 44	20 34	21 22	21 16
66	1 48	////	17 56	19 11	20 02	20 28
64	2 24	////	17 25	18 33	19 24	19 57
62	2 50	////	17 02	18 07	18 58	19 34
60	3 09	////	16 43	17 46	18 37	19 15
58	3 25	////	16 28	17 29	18 20	19 00
56	3 39	////	16 15	17 15	18 06	18 47
54	3 51	////	16 04	17 03	17 53	18 35
52	4 01	////	15 54	16 52	17 43	18 25
50	4 11	0 58	15 45	16 42	17 33	18 16
45	4 30	2 11	15 26	16 22	17 13	17 57
40	4 46	2 49	15 11	16 06	16 56	17 41
35	4 59	3 16	14 58	15 52	16 42	17 28
30	5 11	3 37	14 47	15 40	16 30	17 16
20	5 30	4 08	14 27	15 19	16 09	16 56
10	5 47	4 31	14 11	15 01	15 51	16 39
0	6 03	4 48	13 55	14 45	15 34	16 23
10	6 18	5 04	13 40	14 28	15 17	16 07
20	6 34	5 18	13 23	14 10	15 00	15 50
30	6 53	5 30	13 04	13 50	14 39	15 30
35	7 04	5 35	12 53	13 38	14 27	15 18
40	7 16	5 41	12 41	13 25	14 13	15 05
45	7 31	5 48	12 26	13 08	13 56	14 49
50	7 49	5 54	12 08	12 49	13 36	14 30
52	7 57	5 56	12 00	12 39	13 26	14 20
54	8 07	5 59	11 50	12 29	13 16	14 10
56	8 17	6 02	11 39	12 17	13 03	13 58
58	8 29	6 05	11 27	12 03	12 49	13 45
60 S	8 43	6 08	11 13	11 47	12 32	13 29

Lat.	Sunset	Twlt. ends	Moonset 17	18	19	20
N °	h m	h m	h m	h m	h m	h m
72	□	□	▬	▬	▬	▬
70	□	□	▬	▬	▬	▬
68	23 28	////	21 25	21 17	22 12	23 59
66	22 21	////	22 13	22 41	23 33	24 47
64	21 46	////	22 44	23 18	24 10	0 10
62	21 21	////	23 08	23 45	24 36	0 36
60	21 02	////	23 26	24 06	0 06	0 57
58	20 46	////	23 42	24 23	0 23	1 14
56	20 32	////	23 55	24 37	0 37	1 28
54	20 20	////	24 07	0 07	0 49	1 40
52	20 10	////	24 17	0 17	1 00	1 51
50	20 01	23 10	24 26	0 26	1 10	2 01
45	19 42	21 59	0 05	0 45	1 30	2 21
40	19 26	21 21	0 19	1 01	1 47	2 37
35	19 13	20 55	0 31	1 14	2 01	2 51
30	19 01	20 34	0 42	1 26	2 13	3 03
20	18 42	20 04	0 59	1 46	2 34	3 24
10	18 25	19 41	1 15	2 03	2 52	3 41
0	18 10	19 24	1 30	2 19	3 09	3 58
10	17 55	19 09	1 44	2 35	3 26	4 15
20	17 38	18 55	2 00	2 53	3 44	4 32
30	17 19	18 43	2 18	3 13	4 04	4 53
35	17 09	18 38	2 28	3 24	4 16	5 04
40	16 56	18 31	2 40	3 37	4 30	5 18
45	16 42	18 26	2 55	3 53	4 47	5 34
50	16 24	18 20	3 12	4 13	5 07	5 54
52	16 16	18 18	3 20	4 22	5 17	6 03
54	16 06	18 14	3 29	4 32	5 28	6 14
56	15 56	18 12	3 40	4 44	5 40	6 26
58	15 44	18 10	3 52	4 58	5 54	6 39
60 S	15 30	18 07	4 05	5 14	6 11	6 55

GMT	Equation of Time (App.—Mean) 17	18	19
h	m s	m s	m s
0	− 5 59.4	− 6 04.4	− 6 08.8
6	− 6 00.7	− 6 05.5	− 6 09.8
12	− 6 02.0	− 6 06.7	− 6 10.8
18	− 6 03.2	− 6 07.7	− 6 11.8
24	− 6 04.4	− 6 08.8	− 6 12.7

DAY	GMT of Transit Meridian of Greenwich Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
17	20 07	9 49	3 50	14 35	19 56
18	20 57	9 46	3 48	14 32	19 52
19	21 46	9 42	3 45	14 29	19 48
20	22 35	9 39	3 42	14 26	19 44

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.1	0.4	0.3
30	0.1	0.3	0.2
45	0.1	0.2	0.2
60	0.1	0.1	0.1
75	0.1	0.1	0.0
90			

Moon's Lower Limb Add

Alt.	17	18	19
°	′	′	′
0	13.3	12.6	12.2
4	13.3	12.6	12.3
8	13.3	12.7	12.3
12	13.3	12.7	12.3
16	13.3	12.7	12.4
20	13.4	12.8	12.4
24	13.4	12.9	12.5
28	13.5	12.9	12.6
32	13.6	13.0	12.7
36	13.6	13.1	12.8
40	13.7	13.2	12.9
44	13.8	13.3	13.0
48	13.9	13.4	13.2
52	14.0	13.6	13.3
56	14.1	13.7	13.5
60	14.2	13.8	13.6
64	14.3	14.0	13.8
68	14.4	14.1	14.0
72	14.6	14.3	14.1
76	14.7	14.4	14.3
80	14.8	14.6	14.5
84	14.9	14.8	14.7
88	15.0	14.9	14.8
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	17	18	19
°	′	′	′
0	16.9	17.2	17.4
4	16.8	17.2	17.4
8	16.8	17.2	17.4
12	16.8	17.2	17.4
16	16.8	17.1	17.3
20	16.7	17.1	17.3
24	16.7	17.0	17.2
28	16.6	16.9	17.1
32	16.6	16.8	17.0
36	16.5	16.7	16.9
40	16.4	16.6	16.8
44	16.3	16.5	16.6
48	16.2	16.4	16.5
52	16.1	16.3	16.4
56	16.0	16.1	16.2
60	15.9	16.0	16.1
64	15.8	15.9	15.9
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.3	15.2	15.2
84	15.2	15.1	15.0
88	15.1	15.0	14.9
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −4.2 GHA	VENUS −4.2 Dec.	MARS −1.5 GHA	MARS −1.5 Dec.	JUPITER −1.3 GHA	JUPITER −1.3 Dec.	SATURN 0.6 GHA	SATURN 0.6 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
20 0	297 44.9	214 52.1	+17 52.8	304 26.0	− 8 16.2	143 06.4	+11 33.7	63 17.8	−17 18.4	32 22.1	115	−21 44.7	+ 16
1	312 47.4	229 54.0	52.8	319 27.8	16.0	158 08.4	33.5	78 20.3	18.4	46 52.6	114	21 43.1	+ 18
2	327 49.8	244 55.9	52.8	334 29.6	15.9	173 10.4	33.3	93 22.8	18.4	61 23.0	114	21 41.3	+ 18
3	342 52.3	259 57.8	·· 52.8	349 31.4	·· 15.7	188 12.4	·· 33.1	108 25.4	·· 18.4	75 53.4	115	·21 39.5	+ 19
4	357 54.8	274 59.6	52.8	4 33.2	15.6	203 14.4	33.0	123 27.9	18.4	90 23.9	115	21 37.6	+ 21
5	12 57.2	290 01.5	52.9	19 35.0	15.4	218 16.4	32.8	138 30.4	18.4	104 54.4	115	21 35.5	+ 21
6	27 59.7	305 03.4	+17 52.9	34 36.8	− 8 15.3	233 18.4	+11 32.6	153 32.9	−17 18.4	119 24.9	116	−21 33.4	+ 22
7	43 02.1	320 05.2	52.9	49 38.6	15.1	248 20.4	32.4	168 35.4	18.4	133 55.5	116	21 31.2	+ 24
8	58 04.6	335 07.1	52.9	64 40.4	15.0	263 22.4	32.3	183 37.9	18.4	148 26.1	116	21 28.8	+ 24
9	73 07.1	350 09.0	·· 52.9	79 42.2	·· 14.8	278 24.4	·· 32.1	198 40.4	·· 18.4	162 56.7	116	·21 26.4	+ 25
10	88 09.5	5 10.8	53.0	94 44.0	14.7	293 26.4	31.9	213 42.9	18.4	177 27.3	116	21 23.9	+ 27
11	103 12.0	20 12.7	53.0	109 45.8	14.5	308 28.4	31.7	228 45.4	18.4	191 57.9	117	21 21.2	+ 27
12	118 14.5	35 14.5	+17 53.0	124 47.6	− 8 14.4	323 30.4	+11 31.6	243 47.9	−17 18.4	206 28.6	117	−21 18.5	+ 28
13	133 16.9	50 16.3	53.0	139 49.4	14.2	338 32.4	31.4	258 50.4	18.4	220 59.3	118	21 15.7	+ 29
14	148 19.4	65 18.2	53.1	154 51.2	14.1	353 34.4	31.2	273 53.0	18.4	235 30.1	117	21 12.8	+ 31
15	163 21.9	80 20.0	·· 53.1	169 53.0	·· 13.9	8 36.4	·· 31.0	288 55.5	·· 18.4	250 00.8	118	·21 09.7	+ 31
16	178 24.3	95 21.9	53.1	184 54.8	13.8	23 38.4	30.8	303 58.0	18.4	264 31.6	118	21 06.6	+ 32
17	193 26.8	110 23.7	53.1	199 56.6	13.7	38 40.4	30.7	319 00.5	18.4	279 02.4	119	21 03.4	+ 33
18	208 29.3	125 25.5	+17 53.2	214 58.4	− 8 13.5	53 42.4	+11 30.5	334 03.0	−17 18.4	293 33.3	118	−21 00.1	+ 34
19	223 31.7	140 27.3	53.2	230 00.2	13.4	68 44.4	30.3	349 05.5	18.4	308 04.1	119	20 56.7	+ 35
20	238 34.2	155 29.1	53.2	245 02.0	13.2	83 46.4	30.1	4 08.0	18.4	322 35.0	120	20 53.2	+ 37
21	253 36.6	170 31.0	·· 53.2	260 03.9	·· 13.1	98 48.4	·· 30.0	19 10.5	·· 18.4	337 06.0	119	·20 49.5	+ 37
22	268 39.1	185 32.8	53.3	275 05.7	12.9	113 50.4	29.8	34 13.0	18.4	351 36.9	120	20 45.8	+ 37
23	283 41.6	200 34.6	53.3	290 07.5	12.8	128 52.4	29.6	49 15.5	18.4	6 07.9	121	20 42.1	+ 39
21 0	298 44.0	215 36.4	+17 53.3	305 09.3	− 8 12.7	143 54.4	+11 29.4	64 18.0	−17 18.4	20 39.0	120	−20 38.2	+ 40
1	313 46.5	230 38.2	53.4	320 11.1	12.5	158 56.4	29.2	79 20.5	18.4	35 10.0	121	20 34.2	+ 41
2	328 49.0	245 40.0	53.4	335 12.9	12.4	173 58.4	29.1	94 23.0	18.4	49 41.1	122	20 30.1	+ 42
3	343 51.4	260 41.8	·· 53.4	350 14.8	·· 12.2	189 00.4	·· 28.9	109 25.5	·· 18.4	64 12.3	121	·20 25.9	+ 42
4	358 53.9	275 43.5	53.5	5 16.6	12.1	204 02.4	28.7	124 28.0	18.4	78 43.4	122	20 21.7	+ 44
5	13 56.4	290 45.3	53.5	20 18.4	11.9	219 04.4	28.5	139 30.6	18.4	93 14.6	122	20 17.3	+ 44
6	28 58.8	305 47.1	+17 53.5	35 20.2	− 8 11.8	234 06.4	+11 28.4	154 33.1	−17 18.4	107 45.8	123	−20 12.9	+ 46
7	44 01.3	320 48.9	53.6	50 22.0	11.7	249 08.4	28.2	169 35.6	18.4	122 17.1	123	20 08.3	+ 46
8	59 03.7	335 50.7	53.6	65 23.9	11.5	264 10.4	28.0	184 38.1	18.4	136 48.4	123	20 03.7	+ 47
9	74 06.2	350 52.4	·· 53.6	80 25.7	·· 11.4	279 12.4	·· 27.8	199 40.6	·· 18.4	151 19.7	124	·19 59.0	+ 48
10	89 08.7	5 54.2	53.7	95 27.5	11.3	294 14.4	27.6	214 43.1	18.4	165 51.1	124	19 54.2	+ 49
11	104 11.1	20 56.0	53.7	110 29.3	11.1	309 16.4	27.5	229 45.6	18.4	180 22.5	124	19 49.3	+ 50
12	119 13.6	35 57.7	+17 53.8	125 31.2	− 8 11.0	324 18.4	+11 27.3	244 48.1	−17 18.4	194 53.9	125	−19 44.3	+ 51
13	134 16.1	50 59.5	53.8	140 33.0	10.8	339 20.4	27.1	259 50.6	18.4	209 25.4	125	19 39.2	+ 51
14	149 18.5	66 01.2	53.8	155 34.8	10.7	354 22.4	26.9	274 53.1	18.4	223 56.9	125	19 34.1	+ 53
15	164 21.0	81 03.0	·· 53.9	170 36.7	·· 10.6	9 24.4	·· 26.8	289 55.6	·· 18.4	238 28.4	126	·19 28.8	+ 53
16	179 23.5	96 04.7	53.9	185 38.5	10.4	24 26.4	26.6	304 58.1	18.4	253 00.0	126	19 23.5	+ 54
17	194 25.9	111 06.5	54.0	200 40.3	10.3	39 28.4	26.4	320 00.6	18.4	267 31.6	127	19 18.1	+ 55
18	209 28.4	126 08.2	+17 54.0	215 42.2	− 8 10.2	54 30.3	+11 26.2	335 03.1	−17 18.4	282 03.3	126	−19 12.6	+ 56
19	224 30.9	141 10.0	54.0	230 44.0	10.0	69 32.3	26.0	350 05.6	18.5	296 34.9	128	19 07.0	+ 57
20	239 33.3	156 11.7	54.1	245 45.8	09.9	84 34.3	25.9	5 08.1	18.5	311 06.7	127	19 01.3	+ 57
21	254 35.8	171 13.4	·· 54.1	260 47.7	·· 09.8	99 36.3	·· 25.7	20 10.6	·· 18.5	325 38.4	128	·18 55.6	+ 59
22	269 38.2	186 15.1	54.2	275 49.5	09.6	114 38.3	25.5	35 13.1	18.5	340 10.2	129	18 49.7	+ 59
23	284 40.7	201 16.9	54.2	290 51.4	09.5	129 40.3	25.3	50 15.6	18.5	354 42.1	128	18 43.8	+ 60
22 0	299 43.2	216 18.6	+17 54.3	305 53.2	− 8 09.4	144 42.3	+11 25.1	65 18.1	−17 18.5	9 13.9	129	−18 37.8	+ 61
1	314 45.6	231 20.3	54.3	320 55.0	09.2	159 44.3	25.0	80 20.6	18.5	23 45.8	130	18 31.7	+ 62
2	329 48.1	246 22.0	54.4	335 56.9	09.1	174 46.3	24.8	95 23.1	18.5	38 17.8	130	18 25.5	+ 62
3	344 50.6	261 23.7	·· 54.4	350 58.7	·· 09.0	189 48.3	·· 24.6	110 25.6	·· 18.5	52 49.8	130	·18 19.3	+ 63
4	359 53.0	276 25.4	54.5	6 00.6	08.8	204 50.3	24.4	125 28.1	18.5	67 21.8	130	18 13.0	+ 65
5	14 55.5	291 27.1	54.5	21 02.4	08.7	219 52.3	24.3	140 30.6	18.5	81 53.8	131	18 06.5	+ 64
6	29 58.0	306 28.8	+17 54.6	36 04.3	− 8 08.6	234 54.3	+11 24.1	155 33.1	−17 18.5	96 25.9	132	−18 00.1	+ 66
7	45 00.4	321 30.5	54.6	51 06.1	08.5	249 56.3	23.9	170 35.6	18.5	110 58.1	131	17 53.5	+ 67
8	60 02.9	336 32.2	54.7	66 08.0	08.3	264 58.3	23.7	185 38.1	18.5	125 30.2	133	17 46.8	+ 67
9	75 05.4	351 33.9	·· 54.7	81 09.8	·· 08.2	280 00.3	·· 23.5	200 40.6	·· 18.5	140 02.5	132	·17 40.1	+ 68
10	90 07.8	6 35.6	54.8	96 11.7	08.1	295 02.3	23.4	215 43.1	18.5	154 34.7	133	17 33.3	+ 68
11	105 10.3	21 37.3	54.8	111 13.5	07.9	310 04.3	23.2	230 45.6	18.5	169 07.0	133	17 26.5	+ 70
12	120 12.7	36 38.9	+17 54.9	126 15.4	− 8 07.8	325 06.3	+11 23.0	245 48.1	−17 18.5	183 39.3	134	−17 19.5	+ 70
13	135 15.2	51 40.6	54.9	141 17.2	07.7	340 08.3	22.8	260 50.6	18.5	198 11.7	134	17 12.5	+ 71
14	150 17.7	66 42.3	55.0	156 19.1	07.6	355 10.3	22.6	275 53.1	18.5	212 44.1	134	17 05.4	+ 72
15	165 20.1	81 44.0	·· 55.1	171 20.9	·· 07.4	10 12.3	·· 22.5	290 55.6	·· 18.5	227 16.5	135	·16 58.2	+ 72
16	180 22.6	96 45.6	55.1	186 22.8	07.3	25 14.3	22.3	305 58.1	18.5	241 49.0	135	16 51.0	+ 74
17	195 25.1	111 47.3	55.2	201 24.6	07.2	40 16.3	22.1	321 00.6	18.5	256 21.5	135	16 43.6	+ 73
18	210 27.5	126 48.9	+17 55.2	216 26.5	− 8 07.1	55 18.3	+11 21.9	336 03.1	−17 18.5	270 54.0	136	−16 36.3	+ 75
19	225 30.0	141 50.6	55.3	231 28.4	06.9	70 20.2	21.7	351 05.6	18.5	285 26.6	136	16 28.8	+ 75
20	240 32.5	156 52.2	55.3	246 30.2	06.8	85 22.2	21.6	6 08.1	18.5	299 59.2	137	16 21.3	+ 76
21	255 34.9	171 53.9	·· 55.4	261 32.1	·· 06.7	100 24.2	·· 21.4	21 10.6	·· 18.5	314 31.9	137	·16 13.7	+ 77
22	270 37.4	186 55.5	55.5	276 34.0	06.6	115 26.2	21.2	36 13.1	18.5	329 04.6	137	16 06.0	+ 78
23	285 39.9	201 57.2	55.5	291 35.8	06.4	130 28.2	21.0	51 15.6	18.5	343 37.3	138	15 58.2	+ 78
24	300 42.3	216 58.8	+17 55.6	306 37.7	− 8 06.3	145 30.2	+11 20.8	66 18.1	−17 18.5	358 10.1	138	−15 50.4	+ 78
code	−	+ 18	0	+ 18	+ 2	+ 20	− 2	+ 25	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
20 0	178 26.8	+20 42.9	7	Acamar	315 50.8	−40 28.4
1	193 26.8	42.4	5	Achernar	335 58.4	−57 27.0
2	208 26.7	42.0	30	Acrux	173 57.3	−62 51.9
3	223 26.7	·· 41.5	19	Adhara	255 46.4	−28 54.7
4	238 26.7	41.0	10	Aldebaran	291 38.6	+16 25.4
5	253 26.6	40.6				
6	268 26.6	+20 40.1	32	Alioth	166 58.2	+56 11.9
7	283 26.6	39.6	34	Alkaid	153 32.4	+49 32.0
8	298 26.5	39.2	55	Al Na'ir	28 36.8	−47 10.0
9	313 26.5	·· 38.7	15	Alnilam	276 29.9	− 1 13.7
10	328 26.5	38.2	25	Alphard	218 38.3	− 8 28.2
11	343 26.4	37.8				
12	358 26.4	+20 37.3	41	Alphecca	126 46.9	+26 51.8
13	13 26.4	36.8	1	Alpheratz	358 27.5	+28 51.1
14	28 26.3	36.3	51	Altair	62 49.5	+ 8 45.3
15	43 26.3	·· 35.9	2	Ankaa	353 57.5	−42 32.1
16	58 26.2	35.4	42	Antares	113 18.3	−26 20.3
17	73 26.2	34.9				
18	88 26.2	+20 34.4	37	Arcturus	146 34.6	+19 24.6
19	103 26.1	34.0	43	Atria	108 58.1	−68 57.2
20	118 26.1	33.5	22	Avior	234 36.1	−59 22.3
21	133 26.1	·· 33.0	13	Bellatrix	279 18.0	+ 6 18.7
22	148 26.1	32.5	16	Betelg'se	271 47.8	+ 7 24.0
23	163 26.0	32.1				
			17	Canopus	264 15.6	−52 40.2
21 0	178 26.0	+20 31.6	12	Capella	281 37.9	+45 57.2
1	193 26.0	31.1	53	Deneb	50 00.1	+45 07.6
2	208 25.9	30.6	28	Denebola	183 17.3	+14 48.9
3	223 25.9	·· 30.1	4	Diphda	349 38.5	−18 13.2
4	238 25.9	29.7				
5	253 25.8	29.2	27	Dubhe	194 44.4	+61 59.3
6	268 25.8	+20 28.7	14	Elnath	279 06.8	+28 34.3
7	283 25.8	28.2	47	Eltanin	91 05.5	+51 29.8
8	298 25.7	27.7	54	Enif	34 28.7	+ 9 40.7
9	313 25.7	·· 27.2	56	Fomalhaut	16 10.7	−29 50.9
10	328 25.7	26.8				
11	343 25.7	26.3	31	Gacrux	172 48.7	−56 52.5
12	358 25.6	+20 25.8	29	Gienah	176 36.3	−17 18.2
13	13 25.6	25.3	35	Hadar	149 48.4	−60 10.2
14	28 25.6	24.8	6	Hamal	328 49.0	+23 15.5
15	43 25.5	·· 24.3	48	Kaus Aust.	84 40.0	−34 24.4
16	58 25.5	23.8				
17	73 25.5	23.4	40	Kochab	137 17.7	+74 20.3
18	88 25.5	+20 22.9	57	Markab	14 20.6	+14 58.4
19	103 25.4	22.4	8	Menkar	314 59.8	+ 3 55.3
20	118 25.4	21.9	36	Menkent	148 57.9	−36 09.6
21	133 25.4	·· 21.4	24	Miapl'dus	221 49.7	−69 32.5
22	148 25.4	20.9				
23	163 25.3	20.4	9	Mirfak	309 41.7	+49 42.3
			50	Nunki	76 50.8	−26 21.0
22 0	178 25.3	+20 19.9	52	Peacock	54 25.7	−56 52.4
1	193 25.3	19.4	21	Pollux	244 20.2	+28 07.9
2	208 25.3	18.9	20	Procyon	245 44.7	+ 5 20.2
3	223 25.2	·· 18.4				
4	238 25.2	17.9	46	R'alhague	96 45.7	+12 35.6
5	253 25.2	17.4	26	Regulus	208 29.1	+12 10.8
6	268 25.2	+20 16.9	11	Rigel	281 53.3	− 8 15.0
7	283 25.1	16.5	38	Rigil Kent.	140 49.9	−60 39.8
8	298 25.1	16.0	44	Sabik	103 01.2	−15 40.3
9	313 25.1	·· 15.5				
10	328 25.1	15.0	3	Schedar	350 29.0	+56 17.8
11	343 25.0	14.5	45	Shaula	97 19.5	−37 04.5
12	358 25.0	+20 14.0	18	Sirius	259 11.6	−16 39.3
13	13 25.0	13.5	33	Spica	159 16.3	−10 56.2
14	28 25.0	13.0	23	Suhail	223 24.3	−43 15.5
15	43 25.0	·· 12.5				
16	58 24.9	12.0	49	Vega	81 07.4	+38 44.7
17	73 24.9	11.5	39	Zub'g'bi	137 52.6	−15 51.8
18	88 24.9	+20 10.9				
19	103 24.9	10.4				
20	118 24.9	09.9				
21	133 24.8	·· 09.4				
22	148 24.8	08.9				
23	163 24.8	08.4				
24	178 24.8	+20 07.9				
code	—	− 5				

Lat.	Sunrise	Twlt. begins	Moonrise 20	21	22	23
N °	h m	h m	h m	h m	h m	h m
72	▭	▭	▬	▬	22 16	21 45
70	▭	▭	▬	22 00	21 35	21 22
68	1 05	////	21 16	21 11	21 08	21 04
66	2 01	////	20 28	20 40	20 46	20 49
64	2 33	////	19 57	20 17	20 29	20 37
62	2 57	////	19 34	19 58	20 15	20 27
60	3 16	////	19 15	19 43	20 03	20 19
58	3 31	////	19 00	19 30	19 53	20 11
56	3 44	////	18 47	19 19	19 44	20 04
54	3 55	////	18 35	19 09	19 36	19 58
52	4 05	////	18 25	19 00	19 28	19 53
50	4 14	1 11	18 16	18 52	19 22	19 48
45	4 33	2 17	17 57	18 35	19 08	19 37
40	4 48	2 54	17 41	18 21	18 56	19 28
35	5 01	3 19	17 28	18 09	18 46	19 20
30	5 12	3 39	17 16	17 59	18 37	19 13
20	5 31	4 09	16 56	17 41	18 22	19 01
10	5 48	4 31	16 39	17 25	18 09	18 51
0	6 03	4 50	16 23	17 11	17 57	18 41
10	6 18	5 04	16 07	16 56	17 44	18 31
20	6 34	5 17	15 50	16 40	17 31	18 21
30	6 52	5 28	15 30	16 22	17 16	18 09
35	7 02	5 34	15 18	16 12	17 07	18 02
40	7 14	5 40	15 05	16 00	16 57	17 54
45	7 28	5 45	14 49	15 46	16 45	17 45
50	7 46	5 52	14 30	15 28	16 30	17 34
52	7 54	5 54	14 20	15 20	16 23	17 28
54	8 03	5 56	14 10	15 11	16 16	17 23
56	8 13	5 59	13 58	15 00	16 07	17 16
58	8 25	6 01	13 45	14 49	15 57	17 09
60	8 38	6 04	13 29	14 35	15 46	17 01
S						

Lat.	Sunset	Twlt. ends	Moonset 20	21	22	23
N °	h m	h m	h m	h m	h m	h m
72	▭	▭	▬	▬	▬	2 14
70	▭	▭	▬	▬	0 54	2 53
68	23 00	////	23 59	25 42	1 42	3 20
66	22 08	////	24 47	0 47	2 13	3 41
64	21 37	////	0 10	1 17	2 35	3 57
62	21 14	////	0 36	1 40	2 53	4 10
60	20 56	////	0 57	1 59	3 08	4 22
58	20 40	////	1 14	2 14	3 21	4 31
56	20 28	////	1 28	2 27	3 32	4 40
54	20 16	////	1 40	2 38	3 41	4 47
52	20 06	////	1 51	2 48	3 50	4 54
50	19 57	22 56	2 01	2 57	3 57	5 00
45	19 39	21 54	2 21	3 16	4 14	5 13
40	19 24	21 18	2 37	3 31	4 27	5 24
35	19 11	20 52	2 51	3 44	4 38	5 33
30	19 00	20 32	3 03	3 55	4 48	5 41
20	18 41	20 02	3 24	4 14	5 05	5 55
10	18 25	19 41	3 41	4 31	5 19	6 07
0	18 10	19 23	3 58	4 46	5 33	6 18
10	17 55	19 09	4 15	5 02	5 47	6 30
20	17 39	18 56	4 32	5 18	6 01	6 41
30	17 21	18 45	4 53	5 37	6 18	6 55
35	17 11	18 40	5 04	5 48	6 27	7 03
40	16 59	18 34	5 18	6 00	6 38	7 11
45	16 45	18 29	5 34	6 15	6 51	7 22
50	16 27	18 22	5 54	6 33	7 06	7 34
52	16 19	18 20	6 03	6 42	7 13	7 40
54	16 10	18 18	6 14	6 51	7 21	7 46
56	16 00	18 15	6 26	7 02	7 30	7 53
58	15 49	18 13	6 39	7 14	7 40	8 01
60	15 35	18 10	6 55	7 28	7 52	8 10
S						

GMT	Equation of Time (App. − Mean) 20	21	22
h	m s	m s	m s
0	− 6 12.7	− 6 16.0	− 6 18.7
6	− 6 13.5	− 6 16.7	− 6 19.3
12	− 6 14.4	− 6 17.4	− 6 19.9
18	− 6 15.2	− 6 18.1	− 6 20.4
24	− 6 16.0	− 6 18.7	− 6 20.9

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
20	22 35	9 39	3 42	14 26	19 44
21	23 22	9 36	3 39	14 23	19 40
22	24 08	9 34	3 36	14 19	19 36
23	0 08	9 31	3 33	14 16	19 32

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.1	0.4	0.3
30	0.1	0.3	0.2
45	0.1	0.2	0.2
60	0.1	0.1	0.1
75	0.1	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	20	21	22
°	′	′	′
0	11.9	11.7	11.7
4	11.9	11.7	11.7
8	11.9	11.8	11.8
12	11.9	11.8	11.8
16	12.0	11.9	11.9
20	12.1	12.0	12.0
24	12.2	12.0	12.0
28	12.2	12.1	12.1
32	12.4	12.2	12.2
36	12.5	12.4	12.4
40	12.6	12.5	12.5
44	12.7	12.6	12.6
48	12.9	12.8	12.8
52	13.1	13.0	13.0
56	13.2	13.1	13.1
60	13.4	13.3	13.3
64	13.6	13.5	13.5
68	13.8	13.7	13.7
72	14.0	13.9	13.9
76	14.2	14.1	14.1
80	14.4	14.3	14.3
84	14.6	14.5	14.5
88	14.7	14.7	14.7
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	20	21	22
°	′	′	′
0	17.7	17.7	17.7
4	17.6	17.7	17.7
8	17.6	17.7	17.7
12	17.6	17.6	17.6
16	17.5	17.6	17.6
20	17.5	17.5	17.5
24	17.4	17.4	17.4
28	17.3	17.3	17.3
32	17.2	17.2	17.2
36	17.0	17.1	17.1
40	16.9	17.0	17.0
44	16.8	16.8	16.8
48	16.6	16.7	16.7
52	16.5	16.5	16.5
56	16.3	16.3	16.3
60	16.1	16.1	16.1
64	15.9	16.0	16.0
68	15.8	15.8	15.8
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.2
84	15.0	14.9	14.9
88	14.8	14.8	14.8
90			

Subtract from table, back cover

Full Moon 22

GMT	♈ GHA	VENUS −4.2 GHA	Dec.	MARS −1.6 GHA	Dec.	JUPITER −1.3 GHA	Dec.	SATURN 0.6 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
23 0	300 42.3	216 58.8	+17 55.6	306 37.7	− 8 06.3	145 30.2	+11 20.8	66 18.1	−17 18.5	358 10.1	138	−15 50.4	+ 78
1	315 44.8	232 00.5	55.6	321 39.5	06.2	160 32.2	20.7	81 20.6	18.5	12 42.9	138	15 42.6	+ 80
2	330 47.2	247 02.1	55.7	336 41.4	06.1	175 34.2	20.5	96 23.1	18.5	27 15.7	139	15 34.6	+ 80
3	345 49.7	262 03.7	·· 55.8	351 43.3	·· 06.0	190 36.2	·· 20.3	111 25.6	·· 18.5	41 48.6	139	·15 26.6	+ 81
4	0 52.2	277 05.3	55.8	6 45.2	05.8	205 38.2	20.1	126 28.1	18.5	56 21.5	140	15 18.5	+ 81
5	15 54.6	292 07.0	55.9	21 47.0	05.7	220 40.2	19.9	141 30.6	18.5	70 54.5	139	15 10.4	+ 82
6	30 57.1	307 08.6	+17 56.0	36 48.9	− 8 05.6	235 42.2	+11 19.8	156 33.1	−17 18.5	85 27.4	141	−15 02.2	+ 83
7	45 59.6	322 10.2	56.0	51 50.8	05.5	250 44.2	19.6	171 35.6	18.5	100 00.5	140	14 53.9	+ 83
8	61 02.0	337 11.8	56.1	66 52.6	05.4	265 46.2	19.4	186 38.1	18.5	114 33.5	141	14 45.6	+ 84
9	76 04.5	352 13.4	·· 56.2	81 54.5	·· 05.2	280 48.2	·· 19.2	201 40.6	·· 18.5	129 06.6	141	·14 37.2	+ 84
10	91 07.0	7 15.0	56.2	96 56.4	05.1	295 50.2	19.0	216 43.1	18.5	143 39.7	142	14 28.8	+ 86
11	106 09.4	22 16.6	56.3	111 58.3	05.0	310 52.2	18.9	231 45.6	18.5	158 12.9	142	14 20.2	+ 85
12	121 11.9	37 18.2	+17 56.4	127 00.2	− 8 04.9	325 54.1	+11 18.7	246 48.1	−17 18.5	172 46.1	142	−14 11.7	+ 87
13	136 14.3	52 19.8	56.4	142 02.0	04.8	340 56.1	18.5	261 50.6	18.6	187 19.3	142	14 03.0	+ 87
14	151 16.8	67 21.4	56.5	157 03.9	04.7	355 58.1	18.3	276 53.1	18.6	201 52.5	143	13 54.3	+ 87
15	166 19.3	82 23.0	·· 56.6	172 05.8	·· 04.5	11 00.1	·· 18.1	291 55.6	·· 18.6	216 25.8	143	·13 45.6	+ 88
16	181 21.7	97 24.6	56.6	187 07.7	04.4	26 02.1	18.0	306 58.1	18.6	230 59.1	144	13 36.8	+ 89
17	196 24.2	112 26.2	56.7	202 09.6	04.3	41 04.1	17.8	322 00.6	18.6	245 32.5	144	13 27.9	+ 89
18	211 26.7	127 27.7	+17 56.8	217 11.4	− 8 04.2	56 06.1	+11 17.6	337 03.1	−17 18.6	260 05.9	144	−13 19.0	+ 90
19	226 29.1	142 29.3	56.9	232 13.3	04.1	71 08.1	17.4	352 05.6	18.6	274 39.3	144	13 10.0	+ 90
20	241 31.6	157 30.9	56.9	247 15.2	04.0	86 10.1	17.2	7 08.1	18.6	289 12.7	145	13 01.0	+ 91
21	256 34.1	172 32.5	·· 57.0	262 17.1	·· 03.9	101 12.1	·· 17.1	22 10.6	·· 18.6	303 46.2	145	·12 51.9	+ 92
22	271 36.5	187 34.0	57.1	277 19.0	03.7	116 14.1	16.9	37 13.1	18.6	318 19.7	145	12 42.7	+ 92
23	286 39.0	202 35.6	57.2	292 20.9	03.6	131 16.1	16.7	52 15.6	18.6	332 53.2	146	12 33.5	+ 92
24 0	301 41.5	217 37.1	+17 57.2	307 22.8	− 8 03.5	146 18.1	+11 16.5	67 18.0	−17 18.6	347 26.8	146	−12 24.3	+ 93
1	316 43.9	232 38.7	57.3	322 24.7	03.4	161 20.1	16.3	82 20.5	18.6	2 00.4	146	12 15.0	+ 94
2	331 46.4	247 40.2	57.4	337 26.6	03.3	176 22.0	16.2	97 23.0	18.6	16 34.0	147	12 05.6	+ 94
3	346 48.8	262 41.8	·· 57.5	352 28.5	·· 03.2	191 24.0	·· 16.0	112 25.5	·· 18.6	31 07.7	147	·11 56.2	+ 95
4	1 51.3	277 43.3	57.5	7 30.4	03.1	206 26.0	15.8	127 28.0	18.6	45 41.4	147	11 46.7	+ 95
5	16 53.8	292 44.9	57.6	22 32.3	03.0	221 28.0	15.6	142 30.5	18.6	60 15.1	147	11 37.2	+ 95
6	31 56.2	307 46.4	+17 57.7	37 34.2	− 8 02.9	236 30.0	+11 15.4	157 33.0	−17 18.6	74 48.8	148	−11 27.7	+ 96
7	46 58.7	322 48.0	57.8	52 36.0	02.7	251 32.0	15.3	172 35.5	18.6	89 22.6	148	11 18.1	+ 97
8	62 01.2	337 49.5	57.9	67 37.9	02.6	266 34.0	15.1	187 38.0	18.6	103 56.4	148	11 08.4	+ 97
9	77 03.6	352 51.0	·· 57.9	82 39.9	·· 02.5	281 36.0	·· 14.9	202 40.5	·· 18.6	118 30.2	148	·10 58.7	+ 97
10	92 06.1	7 52.6	58.0	97 41.8	02.4	296 38.0	14.7	217 43.0	18.6	133 04.0	149	10 49.0	+ 98
11	107 08.6	22 54.1	58.1	112 43.7	02.3	311 40.0	14.5	232 45.5	18.6	147 37.9	149	10 39.2	+ 99
12	122 11.0	37 55.6	+17 58.2	127 45.6	− 8 02.2	326 42.0	+11 14.3	247 48.0	−17 18.6	162 11.8	149	−10 29.3	+ 98
13	137 13.5	52 57.1	58.3	142 47.5	02.1	341 44.0	14.2	262 50.5	18.6	176 45.7	149	10 19.5	+100
14	152 16.0	67 58.6	58.3	157 49.4	02.0	356 46.0	14.0	277 53.0	18.6	191 19.6	149	10 09.5	+ 99
15	167 18.4	83 00.1	·· 58.4	172 51.3	·· 01.9	11 47.9	·· 13.8	292 55.4	·· 18.6	205 53.5	150	· 9 59.6	+100
16	182 20.9	98 01.6	58.5	187 53.2	01.8	26 49.9	13.6	307 57.9	18.6	220 27.5	150	9 49.6	+101
17	197 23.3	113 03.2	58.6	202 55.1	01.7	41 51.9	13.4	323 00.4	18.7	235 01.5	150	9 39.5	+101
18	212 25.8	128 04.7	+17 58.7	217 57.0	− 8 01.6	56 53.9	+11 13.3	338 02.9	−17 18.7	249 35.5	151	− 9 29.4	+101
19	227 28.3	143 06.2	58.8	232 58.9	01.5	71 55.9	13.1	353 05.4	18.7	264 09.6	150	9 19.3	+102
20	242 30.7	158 07.6	58.8	248 00.8	01.4	86 57.9	12.9	8 07.9	18.7	278 43.6	151	9 09.1	+102
21	257 33.2	173 09.1	·· 58.9	263 02.8	·· 01.3	101 59.9	·· 12.7	23 10.4	·· 18.7	293 17.7	151	· 8 58.9	+103
22	272 35.7	188 10.6	59.0	278 04.7	01.2	117 01.9	12.5	38 12.9	18.7	307 51.8	151	8 48.6	+102
23	287 38.1	203 12.1	59.1	293 06.6	01.1	132 03.9	12.3	53 15.4	18.7	322 25.9	152	8 38.4	+104
25 0	302 40.6	218 13.6	+17 59.2	308 08.5	− 8 01.0	147 05.9	+11 12.2	68 17.9	−17 18.7	337 00.1	151	− 8 28.0	+103
1	317 43.1	233 15.1	59.3	323 10.4	00.9	162 07.9	12.0	83 20.3	18.7	351 34.2	152	8 17.7	+104
2	332 45.5	248 16.6	59.4	338 12.3	00.8	177 09.8	11.8	98 22.8	18.7	6 08.4	152	8 07.3	+105
3	347 48.0	263 18.0	·· 59.5	353 14.3	·· 00.7	192 11.8	·· 11.6	113 25.3	·· 18.7	20 42.6	152	· 7 56.8	+104
4	2 50.4	278 19.5	59.5	8 16.2	00.6	207 13.8	11.4	128 27.8	18.7	35 16.8	152	7 46.4	+105
5	17 52.9	293 21.0	59.6	23 18.1	00.5	222 15.8	11.3	143 30.3	18.7	49 51.0	152	7 35.9	+106
6	32 55.4	308 22.4	+17 59.7	38 20.0	− 8 00.4	237 17.8	+11 11.1	158 32.8	−17 18.7	64 25.2	152	− 7 25.3	+106
7	47 57.8	323 23.9	59.8	53 22.0	00.3	252 19.8	10.9	173 35.3	18.7	78 59.4	153	7 14.7	+106
8	63 00.3	338 25.3	17 59.9	68 23.9	00.2	267 21.8	10.7	188 37.8	18.7	93 33.7	153	7 04.1	+106
9	78 02.8	353 26.8	·18 00.0	83 25.8	·· 00.1	282 23.8	·· 10.5	203 40.3	·· 18.7	108 08.0	152	· 6 53.5	+107
10	93 05.2	8 28.3	00.1	98 27.7	8 00.0	297 25.8	10.3	218 42.8	18.7	122 42.2	153	6 42.8	+107
11	108 07.7	23 29.7	00.2	113 29.7	7 59.9	312 27.8	10.2	233 45.2	18.7	137 16.5	153	6 32.1	+107
12	123 10.2	38 31.1	+18 00.3	128 31.6	− 7 59.8	327 29.7	+11 10.0	248 47.7	−17 18.7	151 50.8	153	− 6 21.4	+107
13	138 12.6	53 32.6	00.4	143 33.5	59.7	342 31.7	09.8	263 50.2	18.7	166 25.1	153	6 10.7	+108
14	153 15.1	68 34.0	00.5	158 35.5	59.6	357 33.7	09.6	278 52.7	18.8	180 59.4	154	5 59.9	+108
15	168 17.6	83 35.5	·· 00.6	173 37.4	·· 59.5	12 35.7	·· 09.4	293 55.2	·· 18.8	195 33.8	153	· 5 49.1	+109
16	183 20.0	98 36.9	00.6	188 39.3	59.4	27 37.7	09.3	308 57.7	18.8	210 08.1	153	5 38.2	+108
17	198 22.5	113 38.3	00.7	203 41.3	59.3	42 39.7	09.1	324 00.2	18.8	224 42.4	154	5 27.4	+109
18	213 24.9	128 39.8	+18 00.8	218 43.2	− 7 59.2	57 41.7	+11 08.9	339 02.7	−17 18.8	239 16.8	153	− 5 16.5	+109
19	228 27.4	143 41.2	00.9	233 45.1	59.1	72 43.7	08.7	354 05.1	18.8	253 51.1	154	5 05.6	+110
20	243 29.9	158 42.6	01.0	248 47.1	59.0	87 45.7	08.5	9 07.6	18.8	268 25.5	153	4 54.6	+109
21	258 32.3	173 44.0	·· 01.1	263 49.0	·· 58.9	102 47.7	·· 08.3	24 10.1	·· 18.8	282 59.8	154	· 4 43.7	+110
22	273 34.8	188 45.4	01.2	278 51.0	58.8	117 49.6	08.2	39 12.6	18.8	297 34.2	154	4 32.7	+110
23	288 37.3	203 46.8	01.3	293 52.9	58.7	132 51.6	08.0	54 15.1	18.8	312 08.6	153	4 21.7	+110
24	303 39.7	218 48.3	+18 01.4	308 54.9	− 7 58.6	147 53.6	+11 07.8	69 17.6	−17 18.8	326 42.9	154	− 4 10.7	+111
code	−	+ 15	+ 1	+ 19	+ 1	+ 20	− 1	+ 25	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
23 0	178 24.8	+20 07.9
1	193 24.8	07.4
2	208 24.7	06.9
3	223 24.7	06.4
4	238 24.7	05.9
5	253 24.7	05.4
6	268 24.7	+20 04.9
7	283 24.6	04.4
8	298 24.6	03.8
9	313 24.6	03.3
10	328 24.6	02.8
11	343 24.6	02.3
12	358 24.6	+20 01.8
13	13 24.5	01.3
14	28 24.5	00.8
15	43 24.5	+20 00.2
16	58 24.5	19 59.7
17	73 24.5	59.2
18	88 24.5	+19 58.7
19	103 24.4	58.2
20	118 24.4	57.7
21	133 24.4	57.1
22	148 24.4	56.6
23	163 24.4	56.1
24 0	178 24.4	+19 55.6
1	193 24.4	55.1
2	208 24.4	54.5
3	223 24.3	54.0
4	238 24.3	53.5
5	253 24.3	53.0
6	268 24.3	+19 52.4
7	283 24.3	51.9
8	298 24.3	51.4
9	313 24.3	50.9
10	328 24.3	50.3
11	343 24.2	49.8
12	358 24.2	+19 49.3
13	13 24.2	48.8
14	28 24.2	48.2
15	43 24.2	47.7
16	58 24.2	47.2
17	73 24.2	46.6
18	88 24.2	+19 46.1
19	103 24.2	45.6
20	118 24.2	45.0
21	133 24.2	44.5
22	148 24.1	44.0
23	163 24.1	43.4
25 0	178 24.1	+19 42.9
1	193 24.1	42.4
2	208 24.1	41.8
3	223 24.1	41.3
4	238 24.1	40.8
5	253 24.1	40.2
6	268 24.1	+19 39.7
7	283 24.1	39.1
8	298 24.1	38.6
9	313 24.1	38.1
10	328 24.1	37.5
11	343 24.1	37.0
12	358 24.1	+19 36.4
13	13 24.1	35.9
14	28 24.1	35.4
15	43 24.1	34.8
16	58 24.0	34.3
17	73 24.0	33.7
18	88 24.0	+19 33.2
19	103 24.0	32.6
20	118 24.0	32.1
21	133 24.0	31.5
22	148 24.0	31.0
23	163 24.0	30.4
24	178 24.0	+19 29.9
code	—	− 5

No.	Name	STARS SHA	STARS Dec.
		° ′	° ′
7	Acamar	315 50.8	−40 28.4
5	Achernar	335 58.4	−57 27.0
30	Acrux	173 57.3	−62 51.9
19	Adhara	255 46.4	−28 54.7
10	Aldebaran	291 38.6	+16 25.4
32	Alioth	166 58.2	+56 11.9
34	Alkaid	153 32.4	+49 32.0
55	Al Na'ir	28 36.8	−47 10.0
15	Alnilam	276 29.9	− 1 13.7
25	Alphard	218 38.3	− 8 28.2
41	Alphecca	126 47.0	+26 51.8
1	Alpheratz	358 27.5	+28 51.1
51	Altair	62 49.5	+ 8 45.3
2	Ankaa	353 57.5	−42 32.1
42	Antares	113 18.4	−26 20.3
37	Arcturus	146 34.6	+19 24.6
43	Atria	108 58.1	−68 57.2
22	Avior	234 36.1	−59 22.3
13	Bellatrix	279 18.0	+ 6 18.7
16	Betelg'se	271 47.7	+ 7 24.0
17	Canopus	264 15.6	−52 40.2
12	Capella	281 37.8	+45 57.2
53	Deneb	50 00.1	+45 07.6
28	Denebola	183 17.3	+14 48.9
4	Diphda	349 38.5	−18 13.2
27	Dubhe	194 44.4	+61 59.3
14	Elnath	279 06.8	+28 34.3
47	Eltanin	91 05.5	+51 29.8
54	Enif	34 28.7	+ 9 40.7
56	Fomalhaut	16 10.7	−29 50.9
31	Gacrux	172 48.7	−56 52.5
29	Gienah	176 36.4	−17 18.2
35	Hadar	149 48.5	−60 10.2
6	Hamal	328 48.9	+23 15.5
48	Kaus Aust.	84 40.0	−34 24.4
40	Kochab	137 17.8	+74 20.3
57	Markab	14 20.6	+14 58.4
8	Menkar	314 59.7	+ 3 55.3
36	Menkent	148 57.9	−36 09.6
24	Miapl'dus	221 49.7	−69 32.5
9	Mirfak	309 41.6	+49 42.3
50	Nunki	76 50.8	−26 21.0
52	Peacock	54 25.7	−56 52.4
21	Pollux	244 20.2	+28 07.9
20	Procyon	245 44.7	+ 5 20.2
46	R'alhague	96 45.8	+12 35.6
26	Regulus	208 29.1	+12 10.8
11	Rigel	281 53.3	− 8 15.0
38	Rigil Kent.	140 50.0	−60 39.8
44	Sabik	103 01.2	−15 40.3
3	Schedar	350 29.0	+56 17.8
45	Shaula	97 19.5	−37 04.5
18	Sirius	259 11.6	−16 39.3
33	Spica	159 16.3	−10 56.2
23	Suhail	223 24.3	−43 15.5
49	Vega	81 07.4	+38 44.7
39	Zub'g'bi	137 52.6	−15 51.8

GMT	Equation of Time (App.−Mean) 23	24	25
h	m s	m s	m s
0	− 6 20.9	− 6 22.5	− 6 23.5
6	− 6 21.3	− 6 22.8	− 6 23.6
12	− 6 21.7	− 6 23.0	− 6 23.7
18	− 6 22.1	− 6 23.3	− 6 23.8
24	− 6 22.5	− 6 23.5	− 6 23.9

Lat. N	Sunrise h m	Twlt. begins h m	Moonrise 23 h m	24 h m	25 h m	26 h m
°						
72	▭	▭	21 45	21 24	21 08	20 54
70	▭	▭	21 22	21 11	21 02	20 53
68	1 28	////	21 04	21 00	20 56	20 53
66	2 13	////	20 49	20 51	20 52	20 52
64	2 42	////	20 37	20 43	20 48	20 52
62	3 04	////	20 27	20 37	20 45	20 52
60	3 22	////	20 19	20 31	20 42	20 52
58	3 37	////	20 11	20 26	20 39	20 51
56	3 49	////	20 04	20 21	20 37	20 51
54	4 00	////	19 58	20 17	20 35	20 51
52	4 10	0 22	19 53	20 14	20 33	20 51
50	4 18	1 23	19 48	20 10	20 31	20 51
45	4 36	2 22	19 37	20 03	20 27	20 51
40	4 51	2 57	19 28	19 57	20 24	20 50
35	5 03	3 23	19 20	19 51	20 21	20 50
30	5 14	3 41	19 13	19 47	20 19	20 50
20	5 32	4 11	19 01	19 38	20 14	20 50
10	5 48	4 32	18 51	19 31	20 10	20 49
0	6 03	4 50	18 41	19 25	20 07	20 49
10	6 17	5 04	18 31	19 18	20 03	20 49
20	6 33	5 16	18 21	19 10	20 00	20 49
30	6 50	5 28	18 09	19 02	19 55	20 49
35	7 01	5 33	18 02	18 57	19 53	20 48
40	7 12	5 38	17 54	18 52	19 50	20 48
45	7 26	5 44	17 45	18 46	19 47	20 48
50	7 42	5 48	17 34	18 38	19 43	20 48
52	7 50	5 51	17 28	18 34	19 41	20 48
54	7 59	5 53	17 23	18 30	19 39	20 48
56	8 08	5 56	17 16	18 26	19 37	20 48
58	8 20	5 58	17 09	18 21	19 34	20 48
60	8 32	6 00	17 01	18 16	19 31	20 48
S						

Lat. N	Sunset h m	Twlt. ends h m	Moonset 23 h m	24 h m	25 h m	26 h m
°						
72	▭	▭	2 14	4 17	6 07	7 52
70	▭	▭	2 53	4 39	6 18	7 56
68	22 39	////	3 20	4 55	6 28	7 59
66	21 56	////	3 41	5 08	6 35	8 02
64	21 28	////	3 57	5 19	6 42	8 04
62	21 06	////	4 10	5 29	6 47	8 06
60	20 49	////	4 22	5 37	6 52	8 08
58	20 35	////	4 31	5 43	6 56	8 09
56	20 23	////	4 40	5 50	7 00	8 11
54	20 12	////	4 47	5 55	7 03	8 12
52	20 02	23 36	4 54	6 00	7 06	8 13
50	19 54	22 45	5 00	6 04	7 09	8 14
45	19 36	21 48	5 13	6 14	7 15	8 16
40	19 21	21 13	5 24	6 22	7 20	8 18
35	19 09	20 49	5 33	6 29	7 24	8 20
30	18 58	20 29	5 41	6 35	7 28	8 21
20	18 40	20 01	5 55	6 45	7 34	8 23
10	18 25	19 40	6 07	6 54	7 40	8 25
0	18 10	19 23	6 18	7 02	7 45	8 27
10	17 56	19 10	6 30	7 10	7 50	8 29
20	17 40	18 57	6 41	7 19	7 56	8 31
30	17 23	18 46	6 55	7 29	8 02	8 33
35	17 13	18 41	7 03	7 35	8 05	8 35
40	17 01	18 36	7 11	7 41	8 09	8 36
45	16 48	18 31	7 22	7 49	8 14	8 38
50	16 31	18 25	7 34	7 58	8 19	8 40
52	16 23	18 23	7 40	8 02	8 22	8 41
54	16 15	18 22	7 46	8 07	8 25	8 41
56	16 05	18 19	7 53	8 12	8 28	8 43
58	15 54	18 17	8 01	8 17	8 31	8 44
60	15 41	18 14	8 10	8 23	8 35	8 45
S						

DAY	GMT of Transit Meridian of Greenwich Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
23	0 08	9 31	3 33	14 16	19 32
24	0 52	9 29	3 30	14 13	19 28
25	1 35	9 26	3 27	14 10	19 24
26	2 17	9 24	3 24	14 07	19 20

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.1	0.3	0.3
30	0.1	0.3	0.2
45	0.1	0.2	0.2
60	0.1	0.1	0.1
75	0.1	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	23	24	25
°	′	′	′
0	11.7	12.0	12.2
4	11.7	12.0	12.3
8	11.8	12.0	12.3
12	11.8	12.1	12.3
16	11.9	12.1	12.4
20	12.0	12.2	12.4
24	12.0	12.3	12.5
28	12.1	12.4	12.6
32	12.2	12.5	12.7
36	12.4	12.6	12.8
40	12.5	12.7	12.9
44	12.6	12.8	13.0
48	12.8	13.0	13.2
52	13.0	13.1	13.3
56	13.1	13.3	13.5
60	13.3	13.5	13.6
64	13.5	13.6	13.8
68	13.7	13.8	14.0
72	13.9	14.0	14.1
76	14.1	14.2	14.3
80	14.3	14.4	14.5
84	14.5	14.6	14.7
88	14.7	14.7	14.8
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	23	24	25
°	′	′	′
0	17.7	17.6	17.4
4	17.7	17.6	17.4
8	17.7	17.5	17.4
12	17.6	17.5	17.4
16	17.6	17.5	17.3
20	17.5	17.4	17.3
24	17.4	17.3	17.2
28	17.3	17.2	17.1
32	17.2	17.1	17.0
36	17.1	17.0	16.9
40	17.0	16.9	16.8
44	16.8	16.7	16.6
48	16.7	16.6	16.5
52	16.5	16.4	16.4
56	16.3	16.3	16.2
60	16.1	16.1	16.1
64	16.0	15.9	15.9
68	15.8	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.2
84	14.9	15.0	15.0
88	14.8	14.8	14.9
90			

Subtract from table, back cover

G M T	♈ GHA	VENUS −4.2 GHA	Dec	MARS −1.7 GHA	Dec	JUPITER −1.3 GHA	Dec	SATURN 0.6 GHA	Dec	MOON GHA	code	Dec.	code
	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
26 0	303 39.7	218 48.3	+18 01.4	308 54.9	− 7 58.6	147 53.6	+11 07.8	69 17.6	−17 18.8	326 42.9	154	− 4 10.7	+111
1	318 42.2	233 49.7	01.5	323 56.8	58.6	162 55.6	07.6	84 20.1	18.8	341 17.3	154	3 59.6	+111
2	333 44.7	248 51.1	01.6	338 58.8	58.5	177 57.6	07.4	99 22.5	18.8	355 51.7	153	3 48.5	+111
3	348 47.1	263 52.5	·· 01.7	354 00.7	·· 58.4	192 59.6	·· 07.2	114 25.0	·· 18.8	10 26.0	154	· 3 37.4	+111
4	3 49.6	278 53.9	01.8	9 02.6	58.3	208 01.6	07.1	129 27.5	18.8	25 00.4	153	3 26.3	+111
5	18 52.1	293 55.2	01.9	24 04.6	58.2	223 03.6	06.9	144 30.0	18.8	39 34.7	154	3 15.2	+111
6	33 54.5	308 56.6	+18 02.0	39 06.6	− 7 58.1	238 05.6	+11 06.7	159 32.5	−17 18.8	54 09.1	154	− 3 04.1	+112
7	48 57.0	323 58.0	02.1	54 08.5	58.0	253 07.5	06.5	174 35.0	18.8	68 43.5	153	2 52.9	+112
8	63 59.4	338 59.4	02.2	69 10.5	57.9	268 09.5	06.3	189 37.5	18.9	83 17.8	154	2 41.7	+112
9	79 01.9	354 00.8	·· 02.3	84 12.4	·· 57.8	283 11.5	·· 06.2	204 39.9	·· 18.9	97 52.2	153	· 2 30.5	+112
10	94 04.4	9 02.2	02.4	99 14.4	57.8	298 13.5	06.0	219 42.4	18.9	112 26.5	153	2 19.3	+112
11	109 06.8	24 03.5	02.5	114 16.3	57.7	313 15.5	05.8	234 44.9	18.9	127 00.8	154	2 08.1	+113
12	124 09.3	39 04.9	+18 02.6	129 18.3	− 7 57.6	328 17.5	+11 05.6	249 47.4	−17 18.9	141 35.2	153	− 1 56.8	+112
13	139 11.8	54 06.3	02.7	144 20.2	57.5	343 19.5	05.4	264 49.9	18.9	156 09.5	153	1 45.6	+113
14	154 14.2	69 07.7	02.8	159 22.2	57.4	358 21.5	05.2	279 52.4	18.9	170 43.8	153	1 34.3	+112
15	169 16.7	84 09.0	·· 02.9	174 24.2	·· 57.3	13 23.5	·· 05.1	294 54.8	·· 18.9	185 18.1	153	· 1 23.1	+113
16	184 19.2	99 10.4	03.0	189 26.1	57.2	28 25.4	04.9	309 57.3	18.9	199 52.4	153	1 11.8	+113
17	199 21.6	114 11.7	03.2	204 28.1	57.2	43 27.4	04.7	324 59.8	18.9	214 26.7	153	1 00.5	+113
18	214 24.1	129 13.1	+18 03.3	219 30.1	− 7 57.1	58 29.4	+11 04.5	340 02.3	−17 18.9	229 01.0	152	− 0 49.2	+114
19	229 26.5	144 14.4	03.4	234 32.0	57.0	73 31.4	04.3	355 04.8	18.9	243 35.2	153	0 37.8	+113
20	244 29.0	159 15.8	03.5	249 34.0	56.9	88 33.4	04.1	10 07.3	18.9	258 09.5	152	0 26.5	+113
21	259 31.5	174 17.1	·· 03.6	264 36.0	·· 56.8	103 35.4	·· 04.0	25 09.7	·· 18.9	272 43.7	152	· 0 15.2	+114
22	274 33.9	189 18.5	03.7	279 37.9	56.7	118 37.4	03.8	40 12.2	18.9	287 17.9	152	− 0 03.8	+113
23	289 36.4	204 19.8	03.8	294 39.9	56.7	133 39.4	03.6	55 14.7	18.9	301 52.1	152	+ 0 07.5	+114
27 0	304 38.9	219 21.2	+18 03.9	309 41.9	− 7 56.6	148 41.3	+11 03.4	70 17.2	−17 19.0	316 26.3	151	+ 0 18.9	+113
1	319 41.3	234 22.5	04.0	324 43.8	56.5	163 43.3	03.2	85 19.7	19.0	331 00.4	152	0 30.2	+114
2	334 43.8	249 23.8	04.1	339 45.8	56.4	178 45.3	03.0	100 22.2	19.0	345 34.6	151	0 41.6	+113
3	349 46.3	264 25.1	·· 04.2	354 47.8	·· 56.3	193 47.3	·· 02.9	115 24.6	·· 19.0	0 08.7	151	· 0 52.9	+114
4	4 48.7	279 26.5	04.3	9 49.8	56.3	208 49.3	02.7	130 27.1	19.0	14 42.8	151	1 04.3	+114
5	19 51.2	294 27.8	04.4	24 51.7	56.2	223 51.3	02.5	145 29.6	19.0	29 16.9	151	1 15.7	+114
6	34 53.7	309 29.1	+18 04.5	39 53.7	− 7 56.1	238 53.3	+11 02.3	160 32.1	−17 19.0	43 51.0	150	+ 1 27.1	+113
7	49 56.1	324 30.4	04.7	54 55.7	56.0	253 55.2	02.1	175 34.6	19.0	58 25.0	150	1 38.4	+114
8	64 58.6	339 31.7	04.8	69 57.7	56.0	268 57.2	01.9	190 37.0	19.0	72 59.0	150	1 49.8	+114
9	80 01.0	354 33.1	·· 04.9	84 59.7	·· 55.9	283 59.2	·· 01.7	205 39.5	·· 19.0	87 33.0	150	· 2 01.2	+113
10	95 03.5	9 34.4	05.0	100 01.6	55.8	299 01.2	01.6	220 42.0	19.0	102 07.0	149	2 12.5	+114
11	110 06.0	24 35.7	05.1	115 03.6	55.7	314 03.2	01.4	235 44.5	19.0	116 40.9	149	2 23.9	+114
12	125 08.4	39 37.0	+18 05.2	130 05.6	− 7 55.7	329 05.2	+11 01.2	250 47.0	−17 19.0	131 14.8	149	+ 2 35.3	+113
13	140 10.9	54 38.3	05.3	145 07.6	55.6	344 07.2	01.0	265 49.4	19.0	145 48.7	149	2 46.6	+114
14	155 13.4	69 39.6	05.4	160 09.6	55.5	359 09.2	00.8	280 51.9	19.0	160 22.6	148	2 58.0	+114
15	170 15.8	84 40.9	·· 05.6	175 11.6	·· 55.4	14 11.1	·· 00.6	295 54.4	·· 19.1	174 56.4	148	· 3 09.4	+113
16	185 18.3	99 42.2	05.7	190 13.6	55.4	29 13.1	00.5	310 56.9	19.1	189 30.2	148	3 20.7	+114
17	200 20.8	114 43.4	05.8	205 15.6	55.3	44 15.1	00.3	325 59.4	19.1	204 04.0	147	3 32.1	+113
18	215 23.2	129 44.7	+18 05.9	220 17.6	− 7 55.2	59 17.1	+11 00.1	341 01.8	−17 19.1	218 37.7	147	+ 3 43.4	+113
19	230 25.7	144 46.0	06.0	235 19.6	55.1	74 19.1	10 59.9	356 04.3	19.1	233 11.4	147	3 54.7	+113
20	245 28.2	159 47.3	06.1	250 21.6	55.1	89 21.1	59.7	11 06.8	19.1	247 45.1	147	4 06.0	+113
21	260 30.6	174 48.6	·· 06.2	265 23.5	·· 55.0	104 23.1	·· 59.5	26 09.3	·· 19.1	262 18.8	146	· 4 17.3	+114
22	275 33.1	189 49.8	06.4	280 25.5	54.9	119 25.0	59.4	41 11.8	19.1	276 52.4	145	4 28.7	+112
23	290 35.5	204 51.1	06.5	295 27.5	54.9	134 27.0	59.2	56 14.2	19.1	291 25.9	145	4 39.9	+113
28 0	305 38.0	219 52.4	+18 06.6	310 29.5	− 7 54.8	149 29.0	+10 59.0	71 16.7	−17 19.1	305 59.4	145	+ 4 51.2	+113
1	320 40.5	234 53.6	06.7	325 31.5	54.7	164 31.0	58.8	86 19.2	19.1	320 32.9	145	5 02.5	+112
2	335 42.9	249 54.9	06.8	340 33.5	54.7	179 33.0	58.6	101 21.7	19.1	335 06.4	144	5 13.7	+113
3	350 45.4	264 56.2	·· 06.9	355 35.5	·· 54.6	194 35.0	·· 58.4	116 24.2	·· 19.1	349 39.8	144	· 5 25.0	+112
4	5 47.9	279 57.4	07.1	10 37.6	54.5	209 37.0	58.2	131 26.6	19.1	4 13.2	143	5 36.2	+112
5	20 50.3	294 58.7	07.2	25 39.6	54.4	224 38.9	58.1	146 29.1	19.2	18 46.5	143	5 47.4	+112
6	35 52.8	309 59.9	+18 07.3	40 41.6	− 7 54.4	239 40.9	+10 57.9	161 31.6	−17 19.2	33 19.8	142	+ 5 58.6	+112
7	50 55.3	325 01.2	07.4	55 43.6	54.3	254 42.9	57.7	176 34.1	19.2	47 53.0	142	6 09.8	+111
8	65 57.7	340 02.4	07.5	70 45.6	54.2	269 44.9	57.5	191 36.5	19.2	62 26.2	142	6 20.9	+112
9	81 00.2	355 03.6	·· 07.6	85 47.6	·· 54.2	284 46.9	·· 57.3	206 39.0	·· 19.2	76 59.4	141	· 6 32.1	+111
10	96 02.7	10 04.9	07.8	100 49.6	54.1	299 48.9	57.1	221 41.5	19.2	91 32.5	141	6 43.2	+111
11	111 05.1	25 06.1	07.9	115 51.6	54.1	314 50.9	57.0	236 44.0	19.2	106 05.6	140	6 54.3	+111
12	126 07.6	40 07.4	+18 08.0	130 53.6	− 7 54.0	329 52.8	+10 56.8	251 46.4	−17 19.2	120 38.6	139	+ 7 05.4	+110
13	141 10.0	55 08.6	08.1	145 55.6	53.9	344 54.8	56.6	266 48.9	19.2	135 11.5	140	7 16.4	+111
14	156 12.5	70 09.8	08.2	160 57.7	53.9	359 56.8	56.4	281 51.4	19.2	149 44.5	138	7 27.5	+110
15	171 15.0	85 11.0	·· 08.4	175 59.7	·· 53.8	14 58.8	·· 56.2	296 53.9	·· 19.2	164 17.3	138	· 7 38.5	+110
16	186 17.4	100 12.3	08.5	191 01.7	53.7	30 00.8	56.0	311 56.3	19.2	178 50.1	138	7 49.5	+109
17	201 19.9	115 13.5	08.6	206 03.7	53.7	45 02.8	55.8	326 58.8	19.2	193 22.9	137	8 00.4	+110
18	216 22.4	130 14.7	+18 08.7	221 05.7	− 7 53.6	60 04.7	+10 55.7	342 01.3	−17 19.3	207 55.6	137	+ 8 11.4	+109
19	231 24.8	145 15.9	08.8	236 07.8	53.5	75 06.7	55.5	357 03.8	19.3	222 28.3	136	8 22.3	+109
20	246 27.3	160 17.1	09.0	251 09.8	53.5	90 08.7	55.3	12 06.2	19.3	237 00.9	135	8 33.2	+108
21	261 29.8	175 18.3	·· 09.1	266 11.8	·· 53.4	105 10.7	·· 55.1	27 08.7	·· 19.3	251 33.4	135	· 8 44.0	+108
22	276 32.2	190 19.5	09.2	281 13.8	53.4	120 12.7	54.9	42 11.2	19.3	266 05.9	135	8 54.8	+108
23	291 34.7	205 20.7	09.3	296 15.9	53.3	135 14.7	54.7	57 13.7	19.3	280 38.4	133	9 05.6	+108
24	306 37.1	220 22.0	+18 09.5	311 17.9	− 7 53.3	150 16.7	+10 54.5	72 16.1	−17 19.3	295 10.7	134	+ 9 16.4	+107
ode		+ 13	+ 1	+ 20	+ 1	+ 20	− 2	+ 24	0				

G M T	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
	h	° ′	° ′		° ′	° ′
26	0	178 24.0	+19 29.9	7	Acamar	315 50.7	−40 28.4
	1	193 24.0	29.4	5	Achernar	335 58.3	−57 27.0
	2	208 24.0	28.8	30	Acrux	173 57.3	−62 51.9
	3	223 24.0	·· 28.3	19	Adhara	255 46.4	−28 54.7
	4	238 24.0	27.7	10	Aldebaran	291 38.5	+16 25.4
	5	253 24.0	27.2				
	6	268 24.0	+19 26.6	32	Alioth	166 58.2	+56 11.9
	7	283 24.0	26.0	34	Alkaid	153 32.5	+49 32.0
	8	298 24.0	25.5	55	Al Na'ir	28 36.7	−47 10.0
	9	313 24.0	·· 24.9	15	Alnilam	276 29.9	− 1 13.7
	10	328 24.0	24.4	25	Alphard	218 38.3	− 8 28.2
	11	343 24.0	23.8				
	12	358 24.0	+19 23.3	41	Alphecca	126 47.0	+26 51.8
	13	13 24.0	22.7	1	Alpheratz	358 27.5	+28 51.1
	14	28 24.0	22.2	51	Altair	62 49.5	+ 8 45.3
	15	43 24.0	·· 21.6	2	Ankaa	353 57.5	−42 32.1
	16	58 24.0	21.1	42	Antares	113 18.4	−26 20.3
	17	73 24.0	20.5				
	18	88 24.0	+19 19.9	37	Arcturus	146 34.6	+19 24.6
	19	103 24.0	19.4	43	Atria	108 58.1	−68 57.2
	20	118 24.1	18.8	22	Avior	234 36.1	−59 22.2
	21	133 24.1	·· 18.3	13	Bellatrix	279 18.0	+ 6 18.7
	22	148 24.1	17.7	16	Betelg'se	271 47.7	+ 7 24.0
	23	163 24.1	17.1				
				17	Canopus	264 15.6	−52 40.2
27	0	178 24.1	+19 16.6	12	Capella	281 37.8	+45 57.2
	1	193 24.1	16.0	53	Deneb	50 00.1	+45 07.6
	2	208 24.1	15.5	28	Denebola	183 17.3	+14 48.9
	3	223 24.1	·· 14.9	4	Diphda	349 38.5	−18 13.2
	4	238 24.1	14.3				
	5	253 24.1	13.8	27	Dubhe	194 44.4	+61 59.3
	6	268 24.1	+19 13.2	14	Elnath	279 06.8	+28 34.3
	7	283 24.1	12.6	47	Eltanin	91 05.5	+51 29.9
	8	298 24.1	12.1	54	Enif	34 28.6	+ 9 40.7
	9	313 24.1	·· 11.5	56	Fomalhaut	16 10.6	−29 50.9
	10	328 24.1	10.9				
	11	343 24.1	10.4	31	Gacrux	172 48.7	−56 52.5
	12	358 24.1	+19 09.8	29	Gienah	176 36.4	−17 18.2
	13	13 24.2	09.2	35	Hadar	149 48.5	−60 10.2
	14	28 24.2	08.7	6	Hamal	328 48.9	+23 15.5
	15	43 24.2	·· 08.1	48	Kaus Aust.	84 40.0	−34 24.4
	16	58 24.2	07.5				
	17	73 24.2	06.9	40	Kochab	137 17.8	+74 20.3
	18	88 24.2	+19 06.4	57	Markab	14 20.5	+14 58.4
	19	103 24.2	05.8	8	Menkar	314 59.7	+ 3 55.3
	20	118 24.2	05.2	36	Menkent	148 57.9	−36 09.6
	21	133 24.2	·· 04.7	24	Miapl'dus	221 49.7	−69 32.5
	22	148 24.2	04.1				
	23	163 24.2	03.5	9	Mirfak	309 41.6	+49 42.3
				50	Nunki	76 50.8	−26 21.0
28	0	178 24.3	+19 02.9	52	Peacock	54 25.7	−56 52.4
	1	193 24.3	02.4	21	Pollux	244 20.2	+28 07.9
	2	208 24.3	01.8	20	Procyon	245 44.7	+ 5 20.2
	3	223 24.3	·· 01.2				
	4	238 24.3	00.6	46	R'alhague	96 45.8	+12 35.6
	5	253 24.3	19 00.1	26	Regulus	208 29.1	+12 10.8
	6	268 24.3	+18 59.5	11	Rigel	281 53.3	− 8 15.0
	7	283 24.3	58.9	38	Rigil Kent.	140 50.0	−60 39.8
	8	298 24.4	58.3	44	Sabik	103 01.2	−15 40.3
	9	313 24.4	·· 57.7				
	10	328 24.4	57.2	3	Schedar	350 29.0	+56 17.9
	11	343 24.4	56.6	45	Shaula	97 19.5	−37 04.5
	12	358 24.4	+18 56.0	18	Sirius	259 11.6	−16 39.3
	13	13 24.4	55.4	33	Spica	159 16.3	−10 56.2
	14	28 24.4	54.8	23	Suhail	223 24.3	−43 15.5
	15	43 24.5	·· 54.2				
	16	58 24.5	53.7	49	Vega	81 07.4	+38 44.8
	17	73 24.5	53.1	39	Zub'g'bi	137 52.6	−15 51.8
	18	88 24.5	+18 52.5				
	19	103 24.5	51.9				
	20	118 24.5	51.3				
	21	133 24.5	·· 50.7				
	22	148 24.6	50.1				
	23	163 24.6	49.6				
	24	178 24.6	+18 49.0				
code		—	− 6				

Lat.	Sunrise	Twlt. begins	Moonrise 26	27	28	29
N °	h m	h m	h m	h m	h m	h m
72	□	□	20 54	20 39	20 23	20 03
70	□	□	20 53	20 45	20 35	20 25
68	1 47	////	20 53	20 49	20 46	20 43
66	2 25	////	20 52	20 53	20 54	20 57
64	2 52	////	20 52	20 56	21 01	21 08
62	3 12	////	20 52	20 59	21 08	21 18
60	3 29	////	20 52	21 02	21 13	21 27
58	3 43	////	20 51	21 04	21 18	21 35
56	3 54	////	20 51	21 06	21 22	21 41
54	4 05	////	20 51	21 08	21 26	21 47
52	4 14	0 52	20 51	21 10	21 30	21 53
50	4 22	1 34	20 51	21 11	21 33	21 57
45	4 39	2 28	20 51	21 14	21 40	22 08
40	4 54	3 02	20 50	21 17	21 46	22 17
35	5 05	3 26	20 50	21 20	21 51	22 25
30	5 16	3 44	20 50	21 22	21 55	22 32
20	5 33	4 12	20 50	21 26	22 03	22 43
10	5 49	4 34	20 49	21 29	22 10	22 54
0	6 03	4 50	20 49	21 32	22 17	23 03
10	6 17	5 04	20 49	21 35	22 23	23 13
20	6 32	5 15	20 49	21 39	22 30	23 24
30	6 49	5 26	20 49	21 43	22 38	23 36
35	6 58	5 31	20 48	21 45	22 43	23 43
40	7 10	5 36	20 48	21 48	22 48	23 51
45	7 22	5 41	20 48	21 51	22 55	24 01
50	7 38	5 46	20 48	21 54	23 02	24 12
52	7 46	5 48	20 48	21 56	23 06	24 17
54	7 54	5 50	20 48	21 58	23 10	24 23
56	8 03	5 52	20 48	22 00	23 14	24 30
58	8 14	5 54	20 48	22 02	23 19	24 37
60	8 26	5 56	20 48	22 05	23 24	24 46
S						

Lat.	Sunset	Twlt. ends	Moonset 26	27	28	29
N °	h m	h m	h m	h m	h m	h m
72	□	□	7 52	9 36	11 23	13 19
70	23 38	////	7 56	9 33	11 13	12 58
68	22 21	////	7 59	9 31	11 05	12 43
66	21 44	////	8 02	9 29	10 58	12 30
64	21 19	////	8 04	9 27	10 52	12 19
62	20 59	////	8 06	9 25	10 47	12 10
60	20 42	////	8 08	9 24	10 42	12 02
58	20 29	////	8 09	9 23	10 38	11 56
56	20 17	////	8 11	9 22	10 35	11 50
54	20 07	////	8 12	9 21	10 32	11 44
52	19 58	23 13	8 13	9 20	10 29	11 40
50	19 50	22 34	8 14	9 20	10 27	11 35
45	19 33	21 42	8 16	9 18	10 21	11 26
40	19 19	21 10	8 18	9 17	10 17	11 18
35	19 07	20 46	8 20	9 16	10 13	11 12
30	18 57	20 28	8 21	9 14	10 09	11 06
20	18 39	19 59	8 23	9 13	10 03	10 56
10	18 24	19 39	8 25	9 11	9 58	10 47
0	18 10	19 23	8 27	9 10	9 53	10 39
10	17 56	19 09	8 29	9 08	9 48	10 31
20	17 41	18 57	8 31	9 07	9 43	10 22
30	17 25	18 48	8 33	9 05	9 37	10 12
35	17 15	18 43	8 35	9 04	9 34	10 06
40	17 04	18 38	8 36	9 03	9 30	10 00
45	16 51	18 33	8 38	9 01	9 26	9 52
50	16 35	18 29	8 40	8 59	9 20	9 43
52	16 28	18 27	8 41	8 59	9 18	9 39
54	16 20	18 25	8 41	8 58	9 15	9 34
56	16 10	18 23	8 43	8 57	9 12	9 29
58	16 00	18 21	8 44	8 56	9 09	9 24
60	15 48	18 19	8 45	8 55	9 05	9 18
S						

G M T	Equation of Time (App. − Mean) 26	27	28
h	m s	m s	m s
0	− 6 23.9	− 6 23.7	− 6 23.0
6	− 6 23.9	− 6 23.6	− 6 22.7
12	− 6 23.9	− 6 23.4	− 6 22.4
18	− 6 23.8	− 6 23.2	− 6 22.0
24	− 6 23.7	− 6 23.0	− 6 21.7

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
26	2 17	9 24	3 24	14 07	19 20
27	2 59	9 22	3 21	14 03	19 16
28	3 43	9 20	3 18	14 00	19 12
29	4 28	9 18	3 14	13 57	19 08

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.1	0.3	0.3
30	0.1	0.3	0.2
45	0.1	0.2	0.2
60	0.1	0.1	0.1
75	0.1	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	26	27	28
°	′	′	′
0	12.6	13.1	13.9
4	12.6	13.1	13.9
8	12.7	13.2	13.9
12	12.7	13.2	13.9
16	12.7	13.2	14.0
20	12.8	13.3	14.0
24	12.9	13.3	14.0
28	12.9	13.4	14.1
32	13.0	13.5	14.1
36	13.1	13.5	14.2
40	13.2	13.6	14.2
44	13.3	13.7	14.3
48	13.4	13.8	14.4
52	13.6	13.9	14.4
56	13.7	14.0	14.5
60	13.8	14.1	14.6
64	14.0	14.3	14.7
68	14.1	14.4	14.8
72	14.3	14.5	14.8
76	14.4	14.6	14.9
80	14.6	14.8	15.0
84	14.8	14.9	15.1
88	14.9	15.0	15.2
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	26	27	28
°	′	′	′
0	17.2	16.9	16.5
4	17.2	16.9	16.5
8	17.2	16.9	16.5
12	17.2	16.9	16.5
16	17.1	16.8	16.4
20	17.1	16.8	16.4
24	17.0	16.7	16.4
28	16.9	16.7	16.3
32	16.8	16.6	16.3
36	16.7	16.5	16.2
40	16.6	16.4	16.2
44	16.5	16.4	16.1
48	16.4	16.3	16.0
52	16.3	16.2	16.0
56	16.1	16.0	15.9
60	16.0	15.9	15.8
64	15.9	15.8	15.7
68	15.7	15.7	15.6
72	15.6	15.6	15.6
76	15.4	15.4	15.5
80	15.2	15.3	15.4
84	15.1	15.2	15.3
88	15.0	15.1	15.2
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −4.2 GHA	Dec	MARS −1.7 GHA	Dec	JUPITER −1.3 GHA	Dec	SATURN 0.6 GHA	Dec	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
29 0	306 37.1	220 22.0	+18 09.5	311 17.9	− 7 53.3	150 16.7	+10 54.5	72 16.1	−17 19.3	295 10.7	134	+ 9 16.4	+107
1	321 39.6	235 23.1	09.6	326 19.9	53.2	165 18.6	54.4	87 18.6	19.3	309 43.1	132	9 27.1	+107
2	336 42.1	250 24.3	09.7	341 21.9	53.1	180 20.6	54.2	102 21.1	19.3	324 15.3	132	9 37.8	+107
3	351 44.5	265 25.5	·· 09.8	356 24.0	·· 53.1	195 22.6	·· 54.0	117 23.6	·· 19.3	338 47.5	131	· 9 48.5	+106
4	6 47.0	280 26.7	10.0	11 26.0	53.0	210 24.6	53.8	132 26.0	19.3	353 19.6	131	9 59.1	+106
5	21 49.5	295 27.9	10.1	26 28.0	53.0	225 26.6	53.6	147 28.5	19.3	7 51.7	130	10 09.7	+105
6	36 51.9	310 29.1	+18 10.2	41 30.1	− 7 52.9	240 28.6	+10 53.4	162 31.0	−17 19.4	22 23.7	130	+10 20.2	+106
7	51 54.4	325 30.3	10.3	56 32.1	52.8	255 30.5	53.2	177 33.5	19.4	36 55.7	129	10 30.8	+104
8	66 56.9	340 31.5	10.5	71 34.2	52.8	270 32.5	53.1	192 35.9	19.4	51 27.6	128	10 41.2	+105
9	81 59.3	355 32.6	·· 10.6	86 36.2	·· 52.7	285 34.5	·· 52.9	207 38.4	·· 19.4	65 59.4	127	·10 51.7	+104
10	97 01.8	10 33.8	10.7	101 38.2	52.7	300 36.5	52.7	222 40.9	19.4	80 31.1	127	11 02.1	+103
11	112 04.3	25 35.0	10.8	116 40.3	52.6	315 38.5	52.5	237 43.3	19.4	95 02.8	126	11 12.4	+104
12	127 06.7	40 36.1	+18 11.0	131 42.3	− 7 52.6	330 40.5	+10 52.3	252 45.8	−17 19.4	109 34.4	126	+11 22.8	+102
13	142 09.2	55 37.3	11.1	146 44.4	52.5	345 42.4	52.1	267 48.3	19.4	124 06.0	125	11 33.0	+103
14	157 11.6	70 38.5	11.2	161 46.4	52.5	0 44.4	51.9	282 50.8	19.4	138 37.5	124	11 43.3	+101
15	172 14.1	85 39.6	·· 11.3	176 48.5	·· 52.4	15 46.4	·· 51.8	297 53.2	·· 19.4	153 08.9	123	·11 53.4	+102
16	187 16.6	100 40.8	11.5	191 50.5	52.4	30 48.4	51.6	312 55.7	19.4	167 40.2	123	12 03.6	+101
17	202 19.0	115 41.9	11.6	206 52.6	52.3	45 50.4	51.4	327 58.2	19.5	182 11.5	122	12 13.7	+100
18	217 21.5	130 43.1	+18 11.7	221 54.6	− 7 52.3	60 52.4	+10 51.2	343 00.6	−17 19.5	196 42.7	121	+12 23.7	+100
19	232 24.0	145 44.2	11.8	236 56.7	52.2	75 54.3	51.0	358 03.1	19.5	211 13.8	120	12 33.7	+ 99
20	247 26.4	160 45.4	12.0	251 58.7	52.2	90 56.3	50.8	13 05.6	19.5	225 44.8	120	12 43.6	+ 99
21	262 28.9	175 46.5	·· 12.1	267 00.8	·· 52.1	105 58.3	·· 50.6	28 08.1	·· 19.5	240 15.8	119	·12 53.5	+ 99
22	277 31.4	190 47.7	12.2	282 02.8	52.1	121 00.3	50.5	43 10.5	19.5	254 46.7	118	13 03.4	+ 98
23	292 33.8	205 48.8	12.4	297 04.9	52.0	136 02.3	50.3	58 13.0	19.5	269 17.5	118	13 13.2	+ 97
30 0	307 36.3	220 49.9	+18 12.5	312 06.9	− 7 52.0	151 04.3	+10 50.1	73 15.5	−17 19.5	283 48.3	116	+13 22.9	+ 97
1	322 38.8	235 51.1	12.6	327 09.0	51.9	166 06.2	49.9	88 17.9	19.5	298 18.9	116	13 32.6	+ 96
2	337 41.2	250 52.2	12.7	342 11.0	51.9	181 08.2	49.7	103 20.4	19.5	312 49.5	115	13 42.2	+ 95
3	352 43.7	265 53.3	·· 12.9	357 13.1	·· 51.8	196 10.2	·· 49.5	118 22.9	·· 19.5	327 20.0	114	·13 51.7	+ 95
4	7 46.1	280 54.5	13.0	12 15.2	51.8	211 12.2	49.3	133 25.3	19.6	341 50.4	114	14 01.2	+ 95
5	22 48.6	295 55.6	13.1	27 17.2	51.7	226 14.2	49.2	148 27.8	19.6	356 20.8	113	14 10.7	+ 94
6	37 51.1	310 56.7	+18 13.3	42 19.3	− 7 51.7	241 16.1	+10 49.0	163 30.3	−17 19.6	10 51.1	111	+14 20.1	+ 93
7	52 53.5	325 57.8	13.4	57 21.4	51.6	256 18.1	48.8	178 32.7	19.6	25 21.2	111	14 29.4	+ 92
8	67 56.0	340 58.9	13.5	72 23.4	51.6	271 20.1	48.6	193 35.2	19.6	39 51.3	111	14 38.6	+ 92
9	82 58.5	356 00.0	·· 13.7	87 25.5	·· 51.6	286 22.1	·· 48.4	208 37.7	·· 19.6	54 21.4	109	·14 47.8	+ 92
10	98 00.9	11 01.2	13.8	102 27.6	51.5	301 24.1	48.2	223 40.2	19.6	68 51.3	109	14 57.0	+ 90
11	113 03.4	26 02.3	13.9	117 29.6	51.5	316 26.1	48.0	238 42.6	19.6	83 21.2	107	15 06.0	+ 90
12	128 05.9	41 03.4	+18 14.1	132 31.7	− 7 51.4	331 28.0	+10 47.8	253 45.1	−17 19.6	97 50.9	107	+15 15.0	+ 89
13	143 08.3	56 04.5	14.2	147 33.8	51.4	346 30.0	47.7	268 47.6	19.6	112 20.6	106	15 23.9	+ 89
14	158 10.8	71 05.6	14.3	162 35.9	51.3	1 32.0	47.5	283 50.0	19.7	126 50.2	105	15 32.8	+ 88
15	173 13.2	86 06.7	·· 14.4	177 37.9	·· 51.3	16 34.0	·· 47.3	298 52.5	·· 19.7	141 19.7	105	·15 41.6	+ 87
16	188 15.7	101 07.8	14.6	192 40.0	51.3	31 36.0	47.1	313 55.0	19.7	155 49.2	103	15 50.3	+ 86
17	203 18.2	116 08.8	14.7	207 42.1	51.2	46 37.9	46.9	328 57.4	19.7	170 18.5	102	15 58.9	+ 86
18	218 20.6	131 09.9	+18 14.8	222 44.2	− 7 51.2	61 39.9	+10 46.7	343 59.9	−17 19.7	184 47.7	102	+16 07.5	+ 85
19	233 23.1	146 11.0	15.0	237 46.3	51.1	76 41.9	46.5	359 02.4	19.7	199 16.9	101	16 16.0	+ 84
20	248 25.6	161 12.1	15.1	252 48.3	51.1	91 43.9	46.4	14 04.8	19.7	213 46.0	100	16 24.4	+ 83
21	263 28.0	176 13.2	·· 15.2	267 50.4	·· 51.1	106 45.9	·· 46.2	29 07.3	·· 19.7	228 15.0	99	·16 32.7	+ 83
22	278 30.5	191 14.3	15.4	282 52.5	51.0	121 47.9	46.0	44 09.8	19.7	242 43.9	98	16 41.0	+ 82
23	293 33.0	206 15.3	15.5	297 54.6	51.0	136 49.8	45.8	59 12.2	19.7	257 12.7	97	16 49.2	+ 80
31 0	308 35.4	221 16.4	+18 15.6	312 56.7	− 7 51.0	151 51.8	+10 45.6	74 14.7	−17 19.8	271 41.4	96	+16 57.2	+ 81
1	323 37.9	236 17.5	15.8	327 58.8	50.9	166 53.8	45.4	89 17.2	19.8	286 10.0	96	17 05.3	+ 79
2	338 40.4	251 18.5	15.9	343 00.8	50.9	181 55.8	45.2	104 19.6	19.8	300 38.6	94	17 13.2	+ 78
3	353 42.8	266 19.6	·· 16.0	358 02.9	·· 50.9	196 57.8	·· 45.0	119 22.1	·· 19.8	315 07.0	94	·17 21.0	+ 78
4	8 45.3	281 20.7	16.2	13 05.0	50.8	211 59.7	44.9	134 24.6	19.8	329 35.4	93	17 28.8	+ 76
5	23 47.7	296 21.7	16.3	28 07.1	50.8	227 01.7	44.7	149 27.0	19.8	344 03.7	92	17 36.4	+ 76
6	38 50.2	311 22.8	+18 16.4	43 09.2	− 7 50.7	242 03.7	+10 44.5	164 29.5	−17 19.8	358 31.9	90	+17 44.0	+ 75
7	53 52.7	326 23.8	16.6	58 11.3	50.7	257 05.7	44.3	179 31.9	19.8	12 59.9	90	17 51.5	+ 74
8	68 55.1	341 24.9	16.7	73 13.4	50.7	272 07.7	44.1	194 34.4	19.8	27 27.9	90	17 58.9	+ 73
9	83 57.6	356 25.9	·· 16.9	88 15.5	·· 50.7	287 09.6	·· 43.9	209 36.9	·· 19.8	41 55.9	88	·18 06.2	+ 72
10	99 00.1	11 27.0	17.0	103 17.6	50.6	302 11.6	43.7	224 39.3	19.9	56 23.7	87	18 13.4	+ 71
11	114 02.5	26 28.0	17.1	118 19.7	50.6	317 13.6	43.5	239 41.8	19.9	70 51.4	86	18 20.5	+ 71
12	129 05.0	41 29.1	+18 17.3	133 21.8	− 7 50.6	332 15.6	+10 43.4	254 44.3	−17 19.9	85 19.0	86	+18 27.6	+ 69
13	144 07.5	56 30.1	17.4	148 23.9	50.5	347 17.6	43.2	269 46.7	19.9	99 46.6	84	18 34.5	+ 68
14	159 09.9	71 31.2	17.5	163 26.0	50.5	2 19.5	43.0	284 49.2	19.9	114 14.0	84	18 41.3	+ 67
15	174 12.4	86 32.2	·· 17.7	178 28.1	·· 50.5	17 21.5	·· 42.8	299 51.7	·· 19.9	128 41.4	82	·18 48.0	+ 66
16	189 14.9	101 33.2	17.8	193 30.2	50.4	32 23.5	42.6	314 54.1	19.9	143 08.6	82	18 54.6	+ 66
17	204 17.3	116 34.3	17.9	208 32.3	50.4	47 25.5	42.4	329 56.6	19.9	157 35.8	81	19 01.2	+ 64
18	219 19.8	131 35.3	+18 18.1	223 34.5	− 7 50.4	62 27.5	+10 42.2	344 59.0	−17 19.9	172 02.9	80	+19 07.6	+ 63
19	234 22.2	146 36.3	18.2	238 36.6	50.4	77 29.4	42.0	0 01.5	20.0	186 29.9	79	19 13.9	+ 62
20	249 24.7	161 37.3	18.3	253 38.7	50.3	92 31.4	41.9	15 04.0	20.0	200 56.8	78	19 20.1	+ 61
21	264 27.2	176 38.3	·· 18.5	268 40.8	·· 50.3	107 33.4	·· 41.7	30 06.4	·· 20.0	215 23.6	77	·19 26.2	+ 60
22	279 29.6	191 39.4	18.6	283 42.9	50.3	122 35.4	41.5	45 08.9	20.0	229 50.3	77	19 32.2	+ 59
23	294 32.1	206 40.4	18.8	298 45.0	50.2	137 37.4	41.3	60 11.4	20.0	244 17.0	75	19 38.1	+ 57
24	309 34.6	221 41.4	+18 18.9	313 47.1	− 7 50.2	152 39.3	+10 41.1	75 13.8	−17 20.0	258 43.5	74	+19 43.8	+ 57
Inc.	-	+ 11	+ 1	+ 21	0	+ 20	− 1	+ 25	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
29 0	178 24.6	+18 49.0	7	Acamar	315 50.7	−40 28.4
1	193 24.6	48.4	5	Achernar	335 58.3	−57 27.0
2	208 24.6	47.8	30	Acrux	173 57.4	−62 51.9
3	223 24.7	·· 47.2	19	Adhara	255 46.4	−28 54.7
4	238 24.7	46.6	10	Aldebaran	291 38.5	+16 25.4
5	253 24.7	46.0				
6	268 24.7	+18 45.4	32	Alioth	166 58.2	+56 11.9
7	283 24.7	44.8	34	Alkaid	153 32.5	+49 32.0
8	298 24.7	44.3	55	Al Na'ir	28 36.7	−47 10.0
9	313 24.8	·· 43.7	15	Alnilam	276 29.9	− 1 13.7
10	328 24.8	43.1	25	Alphard	218 38.3	− 8 28.2
11	343 24.8	42.5				
12	358 24.8	+18 41.9	41	Alphecca	126 47.0	+26 51.8
13	13 24.8	41.3	1	Alpheratz	358 27.4	+28 51.1
14	28 24.9	40.7	51	Altair	62 49.5	+ 8 45.3
15	43 24.9	·· 40.1	2	Ankaa	353 57.5	−42 32.1
16	58 24.9	39.5	42	Antares	113 18.4	−26 20.3
17	73 24.9	38.9				
18	88 24.9	+18 38.3	37	Arcturus	146 34.6	+19 24.6
19	103 25.0	37.7	43	Atria	108 58.1	−68 57.3
20	118 25.0	37.1	22	Avior	234 36.1	−59 22.2
21	133 25.0	·· 36.5	13	Bellatrix	279 18.0	+ 6 18.7
22	148 25.0	35.9	16	Betelg'se	271 47.7	+ 7 24.0
23	163 25.1	35.3				
			17	Canopus	264 15.6	−52 40.2
30 0	178 25.1	+18 34.7	12	Capella	281 37.8	+45 57.2
1	193 25.1	34.1	53	Deneb	50 00.1	+45 07.6
2	208 25.1	33.5	28	Denebola	183 17.3	+14 48.9
3	223 25.2	·· 32.9	4	Diphda	349 38.5	−18 13.2
4	238 25.2	32.3				
5	253 25.2	31.7	27	Dubhe	194 44.4	+61 59.3
6	268 25.2	+18 31.1	14	Elnath	279 06.8	+28 34.3
7	283 25.2	30.5	47	Eltanin	91 05.5	+51 29.9
8	298 25.3	29.9	54	Enif	34 28.6	+ 9 40.7
9	313 25.3	·· 29.3	56	Fomalhaut	16 10.6	−29 50.9
10	328 25.3	28.7				
11	343 25.3	28.1	31	Gacrux	172 48.7	−56 52.5
12	358 25.4	+18 27.5	29	Gienah	176 36.4	−17 18.2
13	13 25.4	26.8	35	Hadar	149 48.5	−60 10.2
14	28 25.4	26.2	6	Hamal	328 48.9	+23 15.5
15	43 25.5	·· 25.6	48	Kaus Aust.	84 40.0	−34 24.4
16	58 25.5	25.0				
17	73 25.5	24.4	40	Kochab	137 17.9	+74 20.3
18	88 25.5	+18 23.8	57	Markab	14 20.5	+14 58.4
19	103 25.6	23.2	8	Menkar	314 59.7	+ 3 55.3
20	118 25.6	22.6	36	Menkent	148 57.9	−36 09.6
21	133 25.6	·· 22.0	24	Miapl'dus	221 49.7	−69 32.5
22	148 25.7	21.4				
23	163 25.7	20.7	9	Mirfak	309 41.6	+49 42.3
			50	Nunki	76 50.8	−26 21.0
31 0	178 25.7	+18 20.1	52	Peacock	54 25.7	−56 52.4
1	193 25.7	19.5	21	Pollux	244 20.2	+28 07.9
2	208 25.8	18.9	20	Procyon	245 44.6	+ 5 20.2
3	223 25.8	·· 18.3				
4	238 25.8	17.7	46	R'alhague	96 45.8	+12 35.6
5	253 25.9	17.0	26	Regulus	208 29.1	+12 10.8
6	268 25.9	+18 16.4	11	Rigel	281 53.2	− 8 14.9
7	283 25.9	15.8	38	Rigil Kent.	140 50.0	−60 39.8
8	298 26.0	15.2	44	Sabik	103 01.2	−15 40.3
9	313 26.0	·· 14.6				
10	328 26.0	14.0	3	Schedar	350 28.9	+56 17.9
11	343 26.0	13.3	45	Shaula	97 19.5	−37 04.5
12	358 26.1	+18 12.7	18	Sirius	259 11.6	−16 39.3
13	13 26.1	12.1	33	Spica	159 16.3	−10 56.2
14	28 26.1	11.5	23	Suhail	223 24.3	−43 15.5
15	43 26.2	·· 10.9				
16	58 26.2	10.2	49	Vega	81 07.4	+38 44.8
17	73 26.2	09.6	39	Zub'g'bi	137 52.6	−15 51.8
18	88 26.3	+18 09.0				
19	103 26.3	08.4				
20	118 26.3	07.7				
21	133 26.4	·· 07.1				
22	148 26.4	06.5				
23	163 26.4	05.9				
24	178 26.5	+18 05.2				
code	—	− 7				

GMT	Equation of Time (App. − Mean) 29	30	31
h	m s	m s	m s
0	− 6 21.7	− 6 19.7	− 6 17.2
6	− 6 21.2	− 6 19.2	− 6 16.5
12	− 6 20.8	− 6 18.6	− 6 15.8
18	− 6 20.3	− 6 17.9	− 6 15.0
24	− 6 19.7	− 6 17.2	− 6 14.1

Lat.	Sunrise	Twlt. begins	Moonrise 29	30	31	1
N °	h m	h m	h m	h m	h m	h m
72	▭	▭	20 03	19 30	▭	▭
70	1 06	////	20 25	20 11	19 44	▭
68	2 04	////	20 43	20 40	20 38	20 40
66	2 37	////	20 57	21 01	21 11	21 33
64	3 01	////	21 08	21 19	21 36	22 05
62	3 20	////	21 18	21 33	21 55	22 29
60	3 36	////	21 27	21 45	22 11	22 49
58	3 49	////	21 35	21 56	22 24	23 05
56	4 00	////	21 41	22 05	22 36	23 18
54	4 10	////	21 47	22 13	22 46	23 30
52	4 18	1 11	21 53	22 20	22 55	23 40
50	4 26	1 45	21 57	22 27	23 03	23 50
45	4 43	2 35	22 08	22 41	23 21	24 09
40	4 56	3 05	22 17	22 53	23 35	24 25
35	5 08	3 29	22 25	23 03	23 47	24 39
30	5 18	3 47	22 32	23 12	23 58	24 51
20	5 35	4 14	22 43	23 27	24 16	0 16
10	5 49	4 34	22 54	23 41	24 32	0 32
0	6 03	4 50	23 03	23 54	24 48	0 48
10	6 16	5 04	23 13	24 06	0 06	1 03
20	6 31	5 15	23 24	24 20	0 20	1 19
30	6 47	5 24	23 36	24 36	0 36	1 38
35	6 56	5 29	23 43	24 45	0 45	1 49
40	7 07	5 34	23 51	24 56	0 56	2 01
45	7 19	5 38	24 01	0 01	1 08	2 16
50	7 34	5 43	24 12	0 12	1 23	2 35
52	7 41	5 44	24 17	0 17	1 31	2 43
54	7 49	5 46	24 23	0 23	1 39	2 53
56	7 58	5 48	24 30	0 30	1 47	3 04
58	8 08	5 50	24 37	0 37	1 58	3 17
60	8 19	5 52	24 46	0 46	2 09	3 32
S						

Lat.	Sunset	Twlt. ends	Moonset 29	30	31	1
N °	h m	h m	h m	h m	h m	h m
72	▭	▭	13 19	15 34	▭	▭
70	22 57	////	12 58	14 54	17 11	▭
68	22 04	////	12 43	14 27	16 18	18 14
66	21 32	////	12 30	14 06	15 46	17 21
64	21 09	////	12 19	13 50	15 22	16 49
62	20 50	////	12 10	13 36	15 03	16 26
60	20 35	////	12 02	13 25	14 48	16 07
58	20 22	////	11 56	13 15	14 35	15 51
56	20 12	////	11 50	13 06	14 23	15 38
54	20 02	////	11 44	12 59	14 14	15 26
52	19 53	22 55	11 40	12 52	14 05	15 16
50	19 45	22 23	11 35	12 46	13 57	15 07
45	19 29	21 36	11 26	12 33	13 40	14 48
40	19 16	21 05	11 18	12 22	13 27	14 32
35	19 05	20 43	11 12	12 13	13 15	14 19
30	18 55	20 25	11 06	12 04	13 05	14 07
20	18 38	19 58	10 56	11 50	12 48	13 48
10	18 23	19 38	10 47	11 38	12 33	13 31
0	18 10	19 22	10 39	11 27	12 19	13 15
10	17 57	19 10	10 31	11 16	12 05	12 59
20	17 43	18 59	10 22	11 04	11 50	12 42
30	17 26	18 49	10 12	10 50	11 33	12 22
35	17 17	18 44	10 06	10 42	11 23	12 10
40	17 07	18 41	10 00	10 33	11 12	11 57
45	16 54	18 36	9 52	10 22	10 58	11 42
50	16 39	18 32	9 43	10 10	10 42	11 23
52	16 32	18 30	9 39	10 04	10 35	11 14
54	16 24	18 29	9 34	9 57	10 26	11 04
56	16 16	18 28	9 29	9 50	10 17	10 53
58	16 06	18 26	9 24	9 42	10 06	10 40
60	15 54	18 24	9 18	9 33	9 54	10 24
S						

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
29	4 28	9 18	3 14	13 57	19 08
30	5 15	9 16	3 11	13 54	19 04
31	6 06	9 14	3 08	13 51	19 00
1	7 01	9 13	3 04	13 48	18 56

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.1	0.3	0.3
30	0.1	0.3	0.2
45	0.1	0.2	0.2
60	0.1	0.1	0.1
75	0.1	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	29	30	31
°	′	′	′
0	14.8	15.7	16.8
4	14.8	15.7	16.8
8	14.8	15.7	16.8
12	14.8	15.7	16.8
16	14.8	15.7	16.8
20	14.8	15.7	16.8
24	14.8	15.7	16.7
28	14.9	15.7	16.7
32	14.9	15.7	16.7
36	14.9	15.7	16.6
40	14.9	15.7	16.6
44	15.0	15.6	16.5
48	15.0	15.6	16.5
52	15.0	15.6	16.4
56	15.1	15.6	16.4
60	15.1	15.6	16.3
64	15.1	15.6	16.2
68	15.2	15.6	16.2
72	15.2	15.6	16.1
76	15.3	15.6	16.0
80	15.3	15.6	16.0
84	15.3	15.6	15.9
88	15.4	15.6	15.8
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	29	30	31
°	′	′	′
0	16.0	15.5	14.8
4	16.0	15.5	14.8
8	16.0	15.5	14.8
12	16.0	15.5	14.9
16	16.0	15.5	14.9
20	15.9	15.5	14.9
24	15.9	15.5	14.9
28	15.9	15.5	15.0
32	15.9	15.5	15.0
36	15.9	15.5	15.0
40	15.8	15.5	15.1
44	15.8	15.5	15.1
48	15.8	15.5	15.2
52	15.7	15.5	15.2
56	15.7	15.5	15.3
60	15.7	15.5	15.4
64	15.6	15.5	15.4
68	15.6	15.5	15.5
72	15.6	15.6	15.5
76	15.5	15.6	15.6
80	15.5	15.6	15.7
84	15.4	15.6	15.8
88	15.4	15.6	15.8
90			

Subtract from table, back cover

Last Quarter 30

GMT	♈ GHA	VENUS −4.2 GHA	Dec	MARS −1.8 GHA	Dec.	JUPITER −1.3 GHA	Dec.	SATURN 0.7 GHA	Dec	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
1 00	309 34.6	221 41.4	+18 18.9	313 47.1	− 7 50.2	152 39.3	+10 41.1	75 13.8	−17 20.0	258 43.5	74	+19 43.8	+ 57
01	324 37.0	236 42.4	19.0	328 49.3	50.2	167 41.3	40.9	90 16.3	20.0	273 09.9	74	19 49.5	+ 55
02	339 39.5	251 43.4	19.2	343 51.4	50.2	182 43.3	40.7	105 18.7	20.0	287 36.3	73	19 55.0	+ 55
03	354 42.0	266 44.4	·· 19.3	358 53.5	·· 50.1	197 45.3	·· 40.5	120 21.2	·· 20.0	302 02.6	72	·20 00.5	+ 53
04	9 44.4	281 45.4	19.4	13 55.6	50.1	212 47.3	40.3	135 23.7	20.1	316 28.8	71	20 05.8	+ 52
05	24 46.9	296 46.4	19.6	28 57.7	50.1	227 49.2	40.2	150 26.1	20.1	330 54.9	70	20 11.0	+ 51
06	39 49.3	311 47.4	+18 19.7	43 59.9	− 7 50.1	242 51.2	+10 40.0	165 28.6	−17 20.1	345 20.9	69	+20 16.1	+ 49
07	54 51.8	326 48.4	19.9	59 02.0	50.1	257 53.2	39.8	180 31.0	20.1	359 46.8	68	20 21.0	+ 49
08	69 54.3	341 49.4	20.0	74 04.1	50.0	272 55.2	39.6	195 33.5	20.1	14 12.6	68	20 25.9	+ 47
09	84 56.7	356 50.4	·· 20.1	89 06.3	·· 50.0	287 57.2	·· 39.4	210 36.0	·· 20.1	28 38.4	67	·20 30.6	+ 46
10	99 59.2	11 51.4	20.3	104 08.4	50.0	302 59.1	39.2	225 38.4	20.1	43 04.1	66	20 35.2	+ 45
11	115 01.7	26 52.4	20.4	119 10.5	50.0	318 01.1	39.0	240 40.9	20.1	57 29.7	65	20 39.7	+ 43
12	130 04.1	41 53.3	+18 20.5	134 12.6	− 7 49.9	333 03.1	+10 38.8	255 43.3	−17 20.2	71 55.2	64	+20 44.0	+ 42
13	145 06.6	56 54.3	20.7	149 14.8	49.9	348 05.1	38.7	270 45.8	20.2	86 20.6	63	20 48.2	+ 41
14	160 09.1	71 55.3	20.8	164 16.9	49.9	3 07.0	38.5	285 48.3	20.2	100 45.9	63	20 52.3	+ 40
15	175 11.5	86 56.3	·· 21.0	179 19.0	·· 49.9	18 09.0	·· 38.3	300 50.7	·· 20.2	115 11.2	61	·20 56.3	+ 38
16	190 14.0	101 57.3	21.1	194 21.2	49.9	33 11.0	38.1	315 53.2	20.2	129 36.3	61	21 00.1	+ 37
17	205 16.5	116 58.2	21.2	209 23.3	49.9	48 13.0	37.9	330 55.6	20.2	144 01.4	61	21 03.8	+ 36
18	220 18.9	131 59.2	+18 21.4	224 25.5	− 7 49.8	63 15.0	+10 37.7	345 58.1	−17 20.2	158 26.5	59	+21 07.4	+ 34
19	235 21.4	147 00.2	21.5	239 27.6	49.8	78 16.9	37.5	1 00.6	20.2	172 51.4	59	21 10.8	+ 33
20	250 23.8	162 01.1	21.7	254 29.7	49.8	93 18.9	37.3	16 03.0	20.2	187 16.3	58	21 14.1	+ 32
21	265 26.3	177 02.1	·· 21.8	269 31.9	·· 49.8	108 20.9	·· 37.1	31 05.5	·· 20.3	201 41.1	57	·21 17.3	+ 30
22	280 28.8	192 03.0	21.9	284 34.0	49.8	123 22.9	37.0	46 07.9	20.3	216 05.8	56	21 20.3	+ 29
23	295 31.2	207 04.0	22.1	299 36.2	49.8	138 24.8	36.8	61 10.4	20.3	230 30.4	56	21 23.2	+ 28
2 00	310 33.7	222 05.0	+18 22.2	314 38.3	− 7 49.7	153 26.8	+10 36.6	76 12.8	−17 20.3	244 55.0	55	+21 26.0	+ 26
01	325 36.2	237 05.9	22.4	329 40.5	49.7	168 28.8	36.4	91 15.3	20.3	259 19.5	54	21 28.6	+ 25
02	340 38.6	252 06.9	22.5	344 42.6	49.7	183 30.8	36.2	106 17.8	20.3	273 43.9	54	21 31.1	+ 23
03	355 41.1	267 07.8	·· 22.6	359 44.8	·· 49.7	198 32.8	·· 36.0	121 20.2	·· 20.3	288 08.3	53	·21 33.4	+ 22
04	10 43.6	282 08.7	22.8	14 46.9	49.7	213 34.7	35.8	136 22.7	20.3	302 32.6	52	21 35.6	+ 21
05	25 46.0	297 09.7	22.9	29 49.1	49.7	228 36.7	35.6	151 25.1	20.4	316 56.8	51	21 37.7	+ 19
06	40 48.5	312 10.6	+18 23.1	44 51.2	− 7 49.7	243 38.7	+10 35.4	166 27.6	−17 20.4	331 20.9	51	+21 39.6	+ 18
07	55 51.0	327 11.6	23.2	59 53.4	49.7	258 40.7	35.3	181 30.0	20.4	345 45.0	51	21 41.4	+ 16
08	70 53.4	342 12.5	23.3	74 55.6	49.6	273 42.7	35.1	196 32.5	20.4	0 09.1	50	21 43.0	+ 15
09	85 55.9	357 13.4	·· 23.5	89 57.7	·· 49.6	288 44.6	·· 34.9	211 35.0	·· 20.4	14 33.1	49	·21 44.5	+ 13
10	100 58.3	12 14.4	23.6	104 59.9	49.6	303 46.6	34.7	226 37.4	20.4	28 57.0	48	21 45.8	+ 12
11	116 00.8	27 15.3	23.8	120 02.0	49.6	318 48.6	34.5	241 39.9	20.4	43 20.8	48	21 47.0	+ 10
12	131 03.3	42 16.2	+18 23.9	135 04.2	− 7 49.6	333 50.6	+10 34.3	256 42.3	−17 20.4	57 44.6	48	+21 48.0	+ 9
13	146 05.7	57 17.1	24.0	150 06.4	49.6	348 52.5	34.1	271 44.8	20.5	72 08.4	47	21 48.9	+ 8
14	161 08.2	72 18.1	24.2	165 08.5	49.6	3 54.5	33.9	286 47.2	20.5	86 32.1	46	21 49.7	+ 6
15	176 10.7	87 19.0	·· 24.3	180 10.7	·· 49.6	18 56.5	·· 33.7	301 49.7	·· 20.5	100 55.7	46	·21 50.3	+ 4
16	191 13.1	102 19.9	24.5	195 12.9	49.6	33 58.5	33.6	316 52.1	20.5	115 19.3	45	21 50.7	+ 3
17	206 15.6	117 20.8	24.6	210 15.0	49.6	49 00.4	33.4	331 54.6	20.5	129 42.8	45	21 51.0	+ 1
18	221 18.1	132 21.7	+18 24.7	225 17.2	− 7 49.6	64 02.4	+10 33.2	346 57.1	−17 20.5	144 06.3	45	+21 51.1	0
19	236 20.5	147 22.6	24.9	240 19.4	49.6	79 04.4	33.0	1 59.5	20.5	158 29.8	44	21 51.1	− 2
20	251 23.0	162 23.5	25.0	255 21.6	49.6	94 06.4	32.8	17 02.0	20.5	172 53.2	44	21 50.9	− 3
21	266 25.5	177 24.4	·· 25.2	270 23.7	·· 49.6	109 08.4	·· 32.6	32 04.4	·· 20.6	187 16.6	43	·21 50.6	− 5
22	281 27.9	192 25.3	25.3	285 25.9	49.5	124 10.3	32.4	47 06.9	20.6	201 39.9	43	21 50.1	− 6
23	296 30.4	207 26.2	25.4	300 28.1	49.5	139 12.3	32.2	62 09.3	20.6	216 03.2	42	21 49.5	− 8
3 00	311 32.8	222 27.1	+18 25.6	315 30.3	− 7 49.5	154 14.3	+10 32.0	77 11.8	−17 20.6	230 26.4	42	+21 48.7	− 9
01	326 35.3	237 28.0	25.7	330 32.5	49.5	169 16.3	31.8	92 14.2	20.6	244 49.6	42	21 47.8	− 11
02	341 37.8	252 28.9	25.9	345 34.6	49.5	184 18.2	31.7	107 16.7	20.6	259 12.8	41	21 46.7	− 13
03	356 40.2	267 29.8	·· 26.0	0 36.8	·· 49.5	199 20.2	·· 31.5	122 19.1	·· 20.6	273 35.9	42	·21 45.4	− 14
04	11 42.7	282 30.7	26.1	15 39.0	49.5	214 22.2	31.3	137 21.6	20.7	287 59.1	40	21 44.0	− 16
05	26 45.2	297 31.6	26.3	30 41.2	49.5	229 24.2	31.1	152 24.0	20.7	302 22.1	41	21 42.4	− 17
06	41 47.6	312 32.5	+18 26.4	45 43.4	− 7 49.5	244 26.1	+10 30.9	167 26.5	−17 20.7	316 45.2	40	+21 40.7	− 19
07	56 50.1	327 33.4	26.6	60 45.6	49.5	259 28.1	30.7	182 28.9	20.7	331 08.2	41	21 38.8	− 20
08	71 52.6	342 34.2	26.7	75 47.7	49.5	274 30.1	30.5	197 31.4	20.7	345 31.3	40	21 36.8	− 22
09	86 55.0	357 35.1	·· 26.8	90 49.9	·· 49.5	289 32.1	·· 30.3	212 33.8	·· 20.7	359 54.3	39	·21 34.6	− 23
10	101 57.5	12 36.0	27.0	105 52.1	49.5	304 34.0	30.1	227 36.3	20.7	14 17.2	40	21 32.3	− 25
11	116 59.9	27 36.9	27.1	120 54.3	49.5	319 36.0	29.9	242 38.8	20.7	28 40.2	39	21 29.8	− 27
12	132 02.4	42 37.7	+18 27.3	135 56.5	− 7 49.5	334 38.0	+10 29.8	257 41.2	−17 20.8	43 03.1	39	+21 27.1	− 28
13	147 04.9	57 38.6	27.4	150 58.7	49.5	349 40.0	29.6	272 43.7	20.8	57 26.0	40	21 24.3	− 30
14	162 07.3	72 39.5	27.6	166 00.9	49.5	4 42.0	29.4	287 46.1	20.8	71 49.0	39	21 21.3	− 31
15	177 09.8	87 40.3	·· 27.7	181 03.1	·· 49.6	19 43.9	·· 29.2	302 48.6	·· 20.8	86 11.9	39	·21 18.2	− 33
16	192 12.3	102 41.2	27.8	196 05.3	49.6	34 45.9	29.0	317 51.0	20.8	100 34.8	38	21 14.9	− 35
17	207 14.7	117 42.1	28.0	211 07.5	49.6	49 47.9	28.8	332 53.5	20.8	114 57.6	39	21 11.4	− 36
18	222 17.2	132 42.9	+18 28.1	226 09.7	− 7 49.6	64 49.9	+10 28.6	347 55.9	−17 20.8	129 20.5	39	+21 07.8	− 37
19	237 19.7	147 43.8	28.3	241 11.9	49.6	79 51.8	28.4	2 58.4	20.9	143 43.4	39	21 04.1	− 40
20	252 22.1	162 44.6	28.4	256 14.1	49.6	94 53.8	28.2	18 00.8	20.9	158 06.3	39	21 00.1	− 40
21	267 24.6	177 45.5	·· 28.5	271 16.3	·· 49.6	109 55.8	·· 28.0	33 03.3	·· 20.9	172 29.2	39	·20 56.1	− 43
22	282 27.1	192 46.3	28.7	286 18.5	49.6	124 57.8	27.9	48 05.7	20.9	186 52.1	38	20 51.8	− 44
23	297 29.5	207 47.2	28.8	301 20.7	49.6	139 59.7	27.7	63 08.2	20.9	201 14.9	39	20 47.4	− 45
24	312 32.0	222 48.0	+18 29.0	316 23.0	− 7 49.6	155 01.7	+10 27.5	78 10.6	−17 20.9	215 37.8	39	+20 42.9	− 47
d		+ 9	+ 1	+ 22	0	+ 19	− 2	+ 25	− 1				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
1 0	178 26.5	+18 05.2
1	193 26.5	04.6
2	208 26.6	04.0
3	223 26.6	·· 03.4
4	238 26.6	02.7
5	253 26.7	02.1
6	268 26.7	+18 01.5
7	283 26.7	00.9
8	298 26.8	18 00.2
9	313 26.8	·17 59.6
10	328 26.9	59.0
11	343 26.9	58.3
12	358 26.9	+17 57.7
13	13 27.0	57.1
14	28 27.0	56.4
15	43 27.0	·· 55.8
16	58 27.1	55.2
17	73 27.1	54.5
18	88 27.2	+17 53.9
19	103 27.2	53.3
20	118 27.2	52.6
21	133 27.3	·· 52.0
22	148 27.3	51.3
23	163 27.4	50.7
2 0	178 27.4	+17 50.1
1	193 27.5	49.4
2	208 27.5	48.8
3	223 27.5	·· 48.2
4	238 27.6	47.5
5	253 27.6	46.9
6	268 27.7	+17 46.2
7	283 27.7	45.6
8	298 27.7	44.9
9	313 27.8	·· 44.3
10	328 27.8	43.7
11	343 27.9	43.0
12	358 27.9	+17 42.4
13	13 28.0	41.7
14	28 28.0	41.1
15	43 28.1	·· 40.4
16	58 28.1	39.8
17	73 28.1	39.1
18	88 28.2	+17 38.5
19	103 28.2	37.8
20	118 28.3	37.2
21	133 28.3	·· 36.6
22	148 28.4	35.9
23	163 28.4	35.3
3 0	178 28.5	+17 34.6
1	193 28.5	34.0
2	208 28.6	33.3
3	223 28.6	·· 32.6
4	238 28.7	32.0
5	253 28.7	31.3
6	268 28.8	+17 30.7
7	283 28.8	30.0
8	298 28.9	29.4
9	313 28.9	·· 28.7
10	328 29.0	28.1
11	343 29.0	27.4
12	358 29.1	+17 26.8
13	13 29.1	26.1
14	28 29.2	25.4
15	43 29.2	·· 24.8
16	58 29.3	24.1
17	73 29.3	23.5
18	88 29.4	+17 22.8
19	103 29.4	22.2
20	118 29.5	21.5
21	133 29.5	·· 20.8
22	148 29.6	20.2
23	163 29.6	19.5
24	178 29.7	+17 18.8
code	—	− 7

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 50.7	−40 28.4
5	Achernar	335 58.3	−57 27.0
30	Acrux	173 57.4	−62 51.8
19	Adhara	255 46.4	−28 54.7
10	Aldebaran	291 38.5	+16 25.4
32	Alioth	166 58.3	+56 11.9
34	Alkaid	153 32.5	+49 32.0
55	Al Na'ir	28 36.7	−47 10.0
15	Alnilam	276 29.8	− 1 13.6
25	Alphard	218 38.3	− 8 28.2
41	Alphecca	126 47.0	+26 51.8
1	Alpheratz	358 27.4	+28 51.1
51	Altair	62 49.5	+ 8 45.4
2	Ankaa	353 57.4	−42 32.1
42	Antares	113 18.4	−26 20.3
37	Arcturus	146 34.6	+19 24.6
43	Atria	108 58.2	−68 57.3
22	Avior	234 36.1	−59 22.2
13	Bellatrix	279 17.9	+ 6 18.7
16	Betelg'se	271 47.7	+ 7 24.0
17	Canopus	264 15.5	−52 40.2
12	Capella	281 37.8	+45 57.2
53	Deneb	50 00.1	+45 07.6
28	Denebola	183 17.3	+14 48.9
4	Diphda	349 38.4	−18 13.2
27	Dubhe	194 44.4	+61 59.2
14	Elnath	279 06.8	+28 34.3
47	Eltanin	91 05.5	+51 29.9
54	Enif	34 28.6	+ 9 40.7
56	Fomalhaut	16 10.6	−29 50.9
31	Gacrux	172 48.8	−56 52.5
29	Gienah	176 36.4	−17 18.2
35	Hadar	149 48.5	−60 10.2
6	Hamal	328 48.9	+23 15.5
48	Kaus Aust.	84 40.0	−34 24.4
40	Kochab	137 18.0	+74 20.3
57	Markab	14 20.5	+14 58.4
8	Menkar	314 59.7	+ 3 55.3
36	Menkent	148 57.9	−36 09.6
24	Miapl'dus	221 49.7	−69 32.4
9	Mirfak	309 41.5	+49 42.3
50	Nunki	76 50.8	−26 21.0
52	Peacock	54 25.7	−56 52.4
21	Pollux	244 20.2	+28 07.9
20	Procyon	245 44.6	+ 5 20.2
46	R'alhague	96 45.8	+12 35.6
26	Regulus	208 29.1	+12 10.8
11	Rigel	281 53.2	− 8 14.9
38	Rigil Kent.	140 50.0	−60 39.8
44	Sabik	103 01.2	−15 40.3
3	Schedar	350 28.9	+56 17.9
45	Shaula	97 19.5	−37 04.5
18	Sirius	259 11.6	−16 39.3
33	Spica	159 16.3	−10 56.2
23	Suhail	223 24.3	−43 15.5
49	Vega	81 07.4	+38 44.8
39	Zub'g'bi	137 52.6	−15 51.8

Lat. N °	Sunrise h m	Twlt. begins h m
72	□	□
70	1 35	////
68	2 20	////
66	2 49	////
64	3 11	////
62	3 28	////
60	3 43	////
58	3 55	////
56	4 05	////
54	4 15	0 29
52	4 23	1 26
50	4 30	1 55
45	4 46	2 40
40	4 59	3 10
35	5 10	3 32
30	5 19	3 50
20	5 36	4 15
10	5 50	4 36
0	6 03	4 51
10	6 16	5 03
20	6 29	5 14
30	6 45	5 23
35	6 54	5 27
40	7 04	5 32
45	7 16	5 35
50	7 30	5 39
52	7 37	5 40
54	7 44	5 42
56	7 52	5 43
58	8 02	5 45
60	8 12	5 46
S		

Lat. N °	Sunset h m	Twlt. ends h m
72	□	□
70	22 31	////
68	21 49	////
66	21 20	////
64	20 59	////
62	20 42	////
60	20 28	////
58	20 16	////
56	20 06	////
54	19 56	23 29
52	19 48	22 41
50	19 41	22 14
45	19 25	21 29
40	19 13	21 01
35	19 02	20 39
30	18 53	20 22
20	18 36	19 55
10	18 23	19 37
0	18 10	19 22
10	17 57	19 10
20	17 43	18 59
30	17 28	18 50
35	17 19	18 46
40	17 09	18 42
45	16 57	18 38
50	16 43	18 35
52	16 36	18 34
54	16 29	18 33
56	16 21	18 32
58	16 11	18 30
60	16 01	18 29
S		

Moonrise	1	2	3	4
	h m	h m	h m	h m
72	□	□	□	□
70	////	□	□	□
68	////	□	□	□
66	////	20 40	21 12	23 01
64	////	21 33	22 22	23 48
62	////	22 05	22 58	24 18
60	////	22 29	23 24	24 41
58	////	22 49	23 44	24 59
56	////	23 05	24 01	0 01
54	0 29	23 18	24 15	0 15
52	1 26	23 30	24 27	0 27
50	1 55	23 40	24 38	0 38
45	2 40	23 50	24 48	0 48
40	3 10	24 09	0 09	1 08
35	3 32	24 25	0 25	1 24
30	3 50	24 39	0 39	1 38
20	4 15	24 51	0 51	1 50
10	4 36	0 16	1 11	2 11
0	4 51	0 32	1 29	2 29
10	5 03	0 48	1 45	2 46
20	5 14	1 03	2 02	3 03
30	5 23	1 19	2 20	3 21
35	5 27	1 38	2 40	3 41
40	5 32	1 49	2 52	3 54
45	5 35	2 01	3 06	4 08
50	5 39	2 16	3 23	4 24
52	5 40	2 35	3 43	4 44
54	5 42	2 43	3 53	4 54
56	5 43	2 53	4 03	5 05
58	5 45	3 04	4 16	5 17
60	5 46	3 17	4 30	5 32
S		3 32	4 47	5 49

Moonset	1	2	3	4
	h m	h m	h m	h m
72	□	□	□	□
70	////	□	□	□
68	////	□	□	□
66	////	18 14	19 48	20 09
64	////	17 21	18 39	19 22
62	////	16 49	18 02	18 51
60	////	16 26	17 36	18 28
58	////	16 07	17 16	18 09
56	////	15 51	16 59	17 53
54	23 29	15 38	16 45	17 40
52	22 41	15 26	16 33	17 29
50	22 14	15 16	16 22	17 18
45	21 29	15 07	16 12	17 09
40	21 01	14 48	15 52	16 50
35	20 39	14 32	15 35	16 34
30	20 22	14 19	15 22	16 21
20	19 55	14 07	15 09	16 09
10	19 37	13 48	14 49	15 49
0	19 22	13 31	14 31	15 32
10	19 10	13 15	14 14	15 15
20	18 59	12 59	13 57	14 59
30	18 50	12 42	13 39	14 41
35	18 46	12 22	13 18	14 21
40	18 42	12 10	13 06	14 09
45	18 38	11 57	12 52	13 55
50	18 35	11 42	12 35	13 39
52	18 34	11 23	12 15	13 18
54	18 33	11 14	12 05	13 09
56	18 32	11 04	11 54	12 58
58	18 30	10 53	11 41	12 46
60	18 29	10 40	11 27	12 32
S		10 24	11 10	12 15

GMT	Equation of Time (App − Mean) 1	2	3
h	m s	m s	m s
0	− 6 14.1	− 6 10.5	− 6 06.2
6	− 6 13.3	− 6 09.4	− 6 05.0
12	− 6 12.4	− 6 08.4	− 6 03.8
18	− 6 11.4	− 6 07.3	− 6 02.6
24	− 6 10.5	− 6 06.2	− 6 01.3

GMT of Transit Meridian of Greenwich					
DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
1	7 01	9 13	3 04	13 48	18 56
2	7 59	9 11	3 01	13 44	18 52
3	9 00	9 10	2 58	13 41	18 48
4	10 02	9 08	2 54	13 38	18 44

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.1	0.3	0.3
30	0.1	0.2	0.3
45	0.1	0.2	0.2
60	0.1	0.1	0.1
75	0.1	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	1	2	3
°	′	′	′
0	17.8	19.0	19.9
4	17.8	19.0	19.9
8	17.8	18.9	19.8
12	17.8	18.9	19.8
16	17.8	18.9	19.7
20	17.7	18.8	19.6
24	17.7	18.7	19.5
28	17.6	18.6	19.4
32	17.5	18.5	19.3
36	17.5	18.4	19.2
40	17.4	18.3	19.0
44	17.3	18.2	18.8
48	17.2	18.0	18.7
52	17.1	17.9	18.5
56	17.0	17.7	18.3
60	16.9	17.6	18.1
64	16.8	17.4	17.9
68	16.7	17.2	17.6
72	16.5	17.0	17.4
76	16.4	16.8	17.2
80	16.3	16.7	17.0
84	16.2	16.5	16.7
88	16.1	16.3	16.5
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	1	2	3
°	′	′	′
0	14.2	13.6	13.1
4	14.3	13.6	13.1
8	14.3	13.6	13.1
12	14.3	13.7	13.2
16	14.3	13.7	13.2
20	14.4	13.8	13.3
24	14.4	13.9	13.4
28	14.5	13.9	13.5
32	14.5	14.0	13.7
36	14.6	14.2	13.8
40	14.7	14.3	13.9
44	14.8	14.4	14.1
48	14.9	14.5	14.3
52	15.0	14.7	14.5
56	15.1	14.9	14.7
60	15.2	15.0	14.9
64	15.3	15.2	15.1
68	15.4	15.4	15.3
72	15.5	15.5	15.5
76	15.7	15.7	15.8
80	15.8	15.9	16.0
84	15.9	16.1	16.2
88	16.0	16.2	16.4
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −4.2 GHA	VENUS −4.2 Dec	MARS −1.9 GHA	MARS −1.9 Dec.	JUPITER −1.3 GHA	JUPITER −1.3 Dec.	SATURN 0.7 GHA	SATURN 0.7 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
4 00	312 32.0	222 48.0	+18 29.0	316 23.0	− 7 49.6	155 01.7	+10 27.5	78 10.6	−17 20.9	215 37.8	39	+20 42.9	− 47
01	327 34.4	237 48.8	29.1	331 25.2	49.6	170 03.7	27.3	93 13.1	20.9	230 00.7	39	20 38.2	− 48
02	342 36.9	252 49.7	29.2	346 27.4	49.6	185 05.7	27.1	108 15.5	21.0	244 23.6	40	20 33.4	− 50
03	357 39.4	267 50.5	·· 29.4	1 29.6	·· 49.6	200 07.6	·· 26.9	123 18.0	·· 21.0	258 46.6	39	·20 28.4	− 52
04	12 41.8	282 51.4	29.5	16 31.8	49.6	215 09.6	26.7	138 20.4	21.0	273 09.5	40	20 23.2	− 53
05	27 44.3	297 52.2	29.7	31 34.0	49.7	230 11.6	26.5	153 22.8	21.0	287 32.5	39	20 17.9	− 54
06	42 46.8	312 53.0	+18 29.8	46 36.3	− 7 49.7	245 13.6	+10 26.3	168 25.3	−17 21.0	301 55.4	40	+20 12.5	− 56
07	57 49.2	327 53.9	29.9	61 38.5	49.7	260 15.5	26.1	183 27.7	21.0	316 18.4	40	20 06.9	− 58
08	72 51.7	342 54.7	30.1	76 40.7	49.7	275 17.5	25.9	198 30.2	21.0	330 41.4	40	20 01.1	− 59
09	87 54.2	357 55.5	·· 30.2	91 42.9	·· 49.7	290 19.5	·· 25.8	213 32.6	·· 21.1	345 04.4	41	·19 55.2	− 61
10	102 56.6	12 56.3	30.4	106 45.1	49.7	305 21.5	25.6	228 35.1	21.1	359 27.5	40	19 49.1	− 62
11	117 59.1	27 57.1	30.5	121 47.4	49.7	320 23.4	25.4	243 37.5	21.1	13 50.5	41	19 42.9	− 63
12	133 01.6	42 58.0	+18 30.7	136 49.6	− 7 49.7	335 25.4	+10 25.2	258 40.0	−17 21.1	28 13.6	42	+19 36.6	− 65
13	148 04.0	57 58.8	30.8	151 51.8	49.8	350 27.4	25.0	273 42.4	21.1	42 36.8	41	19 30.1	− 66
14	163 06.5	72 59.6	30.9	166 54.1	49.8	5 29.4	24.8	288 44.9	21.1	56 59.9	42	19 23.5	− 68
15	178 08.9	88 00.4	·· 31.1	181 56.3	·· 49.8	20 31.3	·· 24.6	303 47.3	·· 21.1	71 23.1	42	·19 16.7	− 70
16	193 11.4	103 01.2	31.2	196 58.5	49.8	35 33.3	24.4	318 49.8	21.2	85 46.3	43	19 09.7	− 70
17	208 13.9	118 02.0	31.4	212 00.7	49.8	50 35.3	24.2	333 52.2	21.2	100 09.6	43	19 02.7	− 72
18	223 16.3	133 02.8	+18 31.5	227 03.0	− 7 49.8	65 37.3	+10 24.0	348 54.7	−17 21.2	114 32.9	43	+18 55.5	− 74
19	238 18.8	148 03.6	31.6	242 05.2	49.9	80 39.2	23.8	3 57.1	21.2	128 56.2	43	18 48.1	− 75
20	253 21.3	163 04.4	31.8	257 07.5	49.9	95 41.2	23.7	18 59.6	21.2	143 19.5	44	18 40.6	− 76
21	268 23.7	178 05.2	·· 31.9	272 09.7	·· 49.9	110 43.2	·· 23.5	34 02.0	·· 21.2	157 42.9	45	·18 33.0	− 78
22	283 26.2	193 06.0	32.1	287 11.9	49.9	125 45.2	23.3	49 04.4	21.2	172 06.4	44	18 25.2	− 79
23	298 28.7	208 06.8	32.2	302 14.2	49.9	140 47.1	23.1	64 06.9	21.3	186 29.8	46	18 17.3	− 80
5 00	313 31.1	223 07.6	+18 32.3	317 16.4	− 7 49.9	155 49.1	+10 22.9	79 09.3	−17 21.3	200 53.4	45	+18 09.3	− 82
01	328 33.6	238 08.4	32.5	332 18.7	50.0	170 51.1	22.7	94 11.8	21.3	215 16.9	46	18 01.1	− 83
02	343 36.0	253 09.2	32.6	347 20.9	50.0	185 53.0	22.5	109 14.2	21.3	229 40.5	47	17 52.8	− 84
03	358 38.5	268 10.0	·· 32.8	2 23.2	·· 50.0	200 55.0	·· 22.3	124 16.7	·· 21.3	244 04.2	47	·17 44.4	− 86
04	13 41.0	283 10.7	32.9	17 25.4	50.0	215 57.0	22.1	139 19.1	21.3	258 27.9	47	17 35.8	− 87
05	28 43.4	298 11.5	33.0	32 27.6	50.0	230 59.0	21.9	154 21.6	21.4	272 51.6	48	17 27.1	− 88
06	43 45.9	313 12.3	+18 33.2	47 29.9	− 7 50.1	246 00.9	+10 21.7	169 24.0	−17 21.4	287 15.4	49	+17 18.3	− 89
07	58 48.4	328 13.1	33.3	62 32.1	50.1	261 02.9	21.6	184 26.5	21.4	301 39.3	49	17 09.4	− 91
08	73 50.8	343 13.9	33.5	77 34.4	50.1	276 04.9	21.4	199 28.9	21.4	316 03.2	49	17 00.3	− 92
09	88 53.3	358 14.6	·· 33.6	92 36.7	·· 50.1	291 06.9	·· 21.2	214 31.3	·· 21.4	330 27.1	50	·16 51.1	− 93
10	103 55.8	13 15.4	33.7	107 38.9	50.2	306 08.8	21.0	229 33.8	21.4	344 51.1	51	16 41.8	− 95
11	118 58.2	28 16.2	33.9	122 41.2	50.2	321 10.8	20.8	244 36.2	21.4	359 15.2	51	16 32.3	− 95
12	134 00.7	43 16.9	+18 34.0	137 43.4	− 7 50.2	336 12.8	+10 20.6	259 38.7	−17 21.5	13 39.3	52	+16 22.8	− 97
13	149 03.2	58 17.7	34.1	152 45.7	50.2	351 14.8	20.4	274 41.1	21.5	28 03.5	52	16 13.1	− 98
14	164 05.6	73 18.5	34.3	167 47.9	50.3	6 16.7	20.2	289 43.6	21.5	42 27.7	53	16 03.3	− 99
15	179 08.1	88 19.2	·· 34.4	182 50.2	·· 50.3	21 18.7	·· 20.0	304 46.0	·· 21.5	56 52.0	53	·15 53.4	−100
16	194 10.5	103 20.0	34.6	197 52.5	50.3	36 20.7	19.8	319 48.4	21.5	71 16.3	54	15 43.4	−101
17	209 13.0	118 20.7	34.7	212 54.7	50.3	51 22.7	19.6	334 50.9	21.5	85 40.7	55	15 33.3	−102
18	224 15.5	133 21.5	+18 34.8	227 57.0	− 7 50.4	66 24.6	+10 19.4	349 53.3	−17 21.6	100 05.2	55	+15 23.1	−104
19	239 17.9	148 22.2	35.0	242 59.3	50.4	81 26.6	19.3	4 55.8	21.6	114 29.7	55	15 12.7	−104
20	254 20.4	163 23.0	35.1	258 01.5	50.4	96 28.6	19.1	19 58.2	21.6	128 54.2	57	15 02.3	−106
21	269 22.9	178 23.7	·· 35.3	273 03.8	·· 50.5	111 30.5	·· 18.9	35 00.6	·· 21.6	143 18.9	57	·14 51.7	−106
22	284 25.3	193 24.5	35.4	288 06.1	50.5	126 32.5	18.7	50 03.1	21.6	157 43.6	57	14 41.1	−108
23	299 27.8	208 25.2	35.5	303 08.4	50.5	141 34.5	18.5	65 05.5	21.6	172 08.3	58	14 30.3	−108
6 00	314 30.3	223 26.0	+18 35.7	318 10.6	− 7 50.5	156 36.5	+10 18.3	80 08.0	−17 21.6	186 33.1	59	+14 19.5	−110
01	329 32.7	238 26.7	35.8	333 12.9	50.6	171 38.4	18.1	95 10.4	21.7	200 58.0	60	14 08.5	−110
02	344 35.2	253 27.4	35.9	348 15.2	50.6	186 40.4	17.9	110 12.8	21.7	215 23.0	60	13 57.5	−112
03	359 37.6	268 28.2	·· 36.1	3 17.5	·· 50.6	201 42.4	·· 17.7	125 15.3	·· 21.7	229 48.0	61	·13 46.3	−112
04	14 40.1	283 28.9	36.2	18 19.8	50.7	216 44.4	17.5	140 17.7	21.7	244 13.1	61	13 35.1	−113
05	29 42.6	298 29.6	36.4	33 22.0	50.7	231 46.3	17.3	155 20.2	21.7	258 38.2	62	13 23.8	−114
06	44 45.0	313 30.4	+18 36.5	48 24.3	− 7 50.7	246 48.3	+10 17.1	170 22.6	−17 21.7	273 03.4	62	+13 12.4	−115
07	59 47.5	328 31.1	36.6	63 26.6	50.8	261 50.3	16.9	185 25.0	21.8	287 28.6	64	13 00.9	−116
08	74 50.0	343 31.8	36.8	78 28.9	50.8	276 52.2	16.8	200 27.5	21.8	301 54.0	64	12 49.3	−117
09	89 52.4	358 32.5	·· 36.9	93 31.2	·· 50.8	291 54.2	·· 16.6	215 29.9	·· 21.8	316 19.4	64	·12 37.6	−118
10	104 54.9	13 33.2	37.0	108 33.5	50.9	306 56.2	16.4	230 32.4	21.8	330 44.8	65	12 25.8	−118
11	119 57.4	28 34.0	37.2	123 35.8	50.9	321 58.2	16.2	245 34.8	21.8	345 10.3	66	12 14.0	−119
12	134 59.8	43 34.7	+18 37.3	138 38.0	− 7 50.9	337 00.1	+10 16.0	260 37.2	−17 21.8	359 35.9	67	+12 02.1	−120
13	150 02.3	58 35.4	37.5	153 40.3	51.0	352 02.1	15.8	275 39.7	21.9	14 01.6	67	11 50.1	−121
14	165 04.8	73 36.1	37.6	168 42.6	51.0	7 04.1	15.6	290 42.1	21.9	28 27.3	68	11 38.0	−121
15	180 07.2	88 36.8	·· 37.7	183 44.9	·· 51.1	22 06.0	·· 15.4	305 44.6	·· 21.9	42 53.1	68	·11 25.9	−122
16	195 09.7	103 37.5	37.9	198 47.2	51.1	37 08.0	15.2	320 47.0	21.9	57 18.9	69	11 13.7	−123
17	210 12.1	118 38.2	38.0	213 49.5	51.1	52 10.0	15.0	335 49.4	21.9	71 44.8	70	11 01.4	−123
18	225 14.6	133 38.9	+18 38.1	228 51.8	− 7 51.2	67 12.0	+10 14.8	350 51.9	−17 21.9	86 10.8	70	+10 49.1	−125
19	240 17.1	148 39.6	38.3	243 54.1	51.2	82 13.9	14.6	5 54.3	22.0	100 36.8	71	10 36.6	−124
20	255 19.5	163 40.3	38.4	258 56.4	51.3	97 15.9	14.4	20 56.7	22.0	115 02.9	72	10 24.2	−126
21	270 22.0	178 41.0	·· 38.5	273 58.7	·· 51.3	112 17.9	·· 14.2	35 59.2	·· 22.0	129 29.1	72	·10 11.6	−126
22	285 24.5	193 41.7	38.7	289 01.0	51.3	127 19.8	14.1	51 01.6	22.0	143 55.3	73	9 59.0	−126
23	300 26.9	208 42.4	38.8	304 03.3	51.4	142 21.8	13.9	66 04.1	22.0	158 21.6	74	9 46.4	−127
24	315 29.4	223 43.1	+18 39.0	319 05.6	− 7 51.4	157 23.8	+10 13.7	81 06.5	−17 22.0	172 48.0	74	+ 9 33.7	−128
code	—	+ 8	+ 1	+ 23	0	+ 20	− 2	+ 24	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
4 00	178 29.7	+17 18.8
01	193 29.8	18.2
02	208 29.8	17.5
03	223 29.9	·· 16.9
04	238 29.9	16.2
05	253 30.0	15.5
06	268 30.0	+17 14.9
07	283 30.1	14.2
08	298 30.1	13.5
09	313 30.2	·· 12.9
10	328 30.2	12.2
11	343 30.3	11.5
12	358 30.4	+17 10.9
13	13 30.4	10.2
14	28 30.5	09.5
15	43 30.5	·· 08.9
16	58 30.6	08.2
17	73 30.6	07.5
18	88 30.7	+17 06.8
19	103 30.8	06.2
20	118 30.8	05.5
21	133 30.9	·· 04.8
22	148 30.9	04.2
23	163 31.0	03.5
5 00	178 31.1	+17 02.8
01	193 31.1	02.1
02	208 31.2	01.5
03	223 31.2	·· 00.8
04	238 31.3	17 00.1
05	253 31.4	16 59.4
06	268 31.4	+16 58.8
07	283 31.5	58.1
08	298 31.5	57.4
09	313 31.6	·· 56.7
10	328 31.7	56.0
11	343 31.7	55.4
12	358 31.8	+16 54.7
13	13 31.9	54.0
14	28 31.9	53.3
15	43 32.0	·· 52.6
16	58 32.0	52.0
17	73 32.1	51.3
18	88 32.2	+16 50.6
19	103 32.2	49.9
20	118 32.3	49.2
21	133 32.4	·· 48.6
22	148 32.4	47.9
23	163 32.5	47.2
6 00	178 32.6	+16 46.5
01	193 32.6	45.8
02	208 32.7	45.1
03	223 32.8	·· 44.4
04	238 32.8	43.8
05	253 32.9	43.1
06	268 33.0	+16 42.4
07	283 33.0	41.7
08	298 33.1	41.0
09	313 33.2	·· 40.3
10	328 33.2	39.6
11	343 33.3	38.9
12	358 33.4	+16 38.2
13	13 33.4	37.5
14	28 33.5	36.9
15	43 33.6	·· 36.2
16	58 33.7	35.5
17	73 33.7	34.8
18	88 33.8	+16 34.1
19	103 33.9	33.4
20	118 33.9	32.7
21	133 34.0	·· 32.0
22	148 34.1	31.3
23	163 34.2	30.6
24	178 34.2	+16 29.9
code	—	− 7

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 50.7	−40 28.3
5	Achernar	335 58.2	−57 27.0
30	Acrux	173 57.4	−62 51.8
19	Adhara	255 46.3	−28 54.6
10	Aldebaran	291 38.5	+16 25.4
32	Alioth	166 58.3	+56 11.9
34	Alkaid	153 32.5	+49 32.0
55	Al Na'ir	28 36.7	−47 10.0
15	Alnilam	276 29.8	− 1 13.6
25	Alphard	218 38.3	− 8 28.2
41	Alphecca	126 47.0	+26 51.8
1	Alpheratz	358 27.4	+28 51.1
51	Altair	62 49.5	+ 8 45.4
2	Ankaa	353 57.4	−42 32.1
42	Antares	113 18.4	−26 20.3
37	Arcturus	146 34.6	+19 24.6
43	Atria	108 58.2	−68 57.3
22	Avior	234 36.1	−59 22.2
13	Bellatrix	279 17.9	+ 6 18.7
16	Betelg'se	271 47.7	+ 7 24.0
17	Canopus	264 15.5	−52 40.1
12	Capella	281 37.7	+45 57.2
53	Deneb	50 00.1	+45 07.7
28	Denebola	183 17.3	+14 48.9
4	Diphda	349 38.4	−18 13.2
27	Dubhe	194 44.4	+61 59.2
14	Elnath	279 06.7	+28 34.3
47	Eltanin	91 05.5	+51 29.9
54	Enif	34 28.6	+ 9 40.7
56	Fomalhaut	16 10.6	−29 50.9
31	Gacrux	172 48.8	−56 52.5
29	Gienah	176 36.4	−17 18.2
35	Hadar	149 48.6	−60 10.2
6	Hamal	328 48.8	+23 15.5
48	Kaus Aust.	84 40.0	−34 24.4
40	Kochab	137 18.0	+74 20.3
57	Markab	14 20.5	+14 58.5
8	Menkar	314 59.6	+ 3 55.3
36	Menkent	148 57.9	−36 09.6
24	Miapl'dus	221 49.7	−69 32.4
9	Mirfak	309 41.5	+49 42.3
50	Nunki	76 50.8	−26 21.0
52	Peacock	54 25.7	−56 52.4
21	Pollux	244 20.1	+28 07.9
20	Procyon	245 44.6	+ 5 20.2
46	R'alhague	96 45.8	+12 35.6
26	Regulus	208 29.1	+12 10.8
11	Rigel	281 53.2	− 8 14.9
38	Rigil Kent.	140 50.1	−60 39.8
44	Sabik	103 01.2	−15 40.3
3	Schedar	350 28.9	+56 17.9
45	Shaula	97 19.5	−37 04.5
18	Sirius	259 11.6	−16 39.3
33	Spica	159 16.3	−10 56.2
23	Suhail	223 24.3	−43 15.5
49	Vega	81 07.5	+38 44.8
39	Zub'g'bi	137 52.6	−15 51.8

GMT	Equation of Time (App. − Mean) 4	5	6
h	m s	m s	m s
0	− 6 01.3	− 5 55.9	− 5 49.9
6	− 6 00.0	− 5 54.4	− 5 48.3
12	− 5 58.7	− 5 53.0	− 5 46.6
18	− 5 57.3	− 5 51.4	− 5 44.9
24	− 5 55.9	− 5 49.9	− 5 43.2

Lat. N °	Sunrise h m	Twlt. begins h m
72	0 35	////
70	1 57	////
68	2 35	////
66	3 00	////
64	3 20	////
62	3 37	////
60	3 50	////
58	4 01	////
56	4 11	////
54	4 20	0 59
52	4 28	1 39
50	4 35	2 04
45	4 50	2 46
40	5 02	3 14
35	5 12	3 35
30	5 21	3 52
20	5 37	4 17
10	5 50	4 36
0	6 02	4 51
10	6 15	5 02
20	6 28	5 12
30	6 42	5 21
35	6 51	5 25
40	7 00	5 28
45	7 12	5 32
50	7 25	5 35
52	7 31	5 36
54	7 38	5 37
56	7 46	5 38
58	7 55	5 39
60	8 05	5 40
S		

Lat. N °	Sunset h m	Twlt. ends h m
72	23 16	////
70	22 09	////
68	21 33	////
66	21 08	////
64	20 49	////
62	20 33	////
60	20 20	////
58	20 09	////
56	19 59	////
54	19 51	23 04
52	19 43	22 28
50	19 36	22 04
45	19 21	21 23
40	19 09	20 55
35	18 59	20 35
30	18 50	20 18
20	18 35	19 54
10	18 22	19 36
0	18 09	19 21
10	17 57	19 09
20	17 44	19 00
30	17 30	18 52
35	17 22	18 49
40	17 12	18 45
45	17 01	18 42
50	16 47	18 38
52	16 41	18 38
54	16 34	18 37
56	16 27	18 36
58	16 18	18 35
60	16 08	18 34
S		

Lat.	Moonrise 4	5	6	7
N °	h m	h m	h m	h m
72	▭	▭	2 25	4 52
70	▭	0 27	2 54	5 06
68	25 09	1 09	3 15	5 16
66	25 37	1 37	3 32	5 25
64	0 18	1 58	3 45	5 33
62	0 41	2 15	3 56	5 39
60	0 59	2 29	4 06	5 44
58	1 14	2 41	4 15	5 49
56	1 27	2 52	4 22	5 53
54	1 39	3 01	4 28	5 57
52	1 48	3 09	4 34	6 00
50	1 57	3 16	4 40	6 04
45	2 16	3 32	4 51	6 10
40	2 32	3 45	5 00	6 16
35	2 45	3 56	5 08	6 21
30	2 56	4 05	5 15	6 25
20	3 15	4 21	5 28	6 32
10	3 32	4 36	5 38	6 38
0	3 48	4 49	5 48	6 44
10	4 03	5 02	5 58	6 50
20	4 20	5 16	6 08	6 57
30	4 39	5 32	6 20	7 04
35	4 50	5 42	6 27	7 08
40	5 03	5 52	6 35	7 13
45	5 18	6 05	6 44	7 18
50	5 37	6 20	6 55	7 25
52	5 46	6 27	7 00	7 28
54	5 55	6 35	7 06	7 31
56	6 06	6 44	7 12	7 35
58	6 19	6 53	7 19	7 39
60	6 34	7 05	7 26	7 43

Lat.	Moonset 4	5	6	7
N °	h m	h m	h m	h m
72	▭	21 02	20 34	20 15
70	20 52	20 31	20 18	20 08
68	20 10	20 09	20 06	20 03
66	19 41	19 51	19 55	19 58
64	19 19	19 36	19 46	19 54
62	19 02	19 24	19 39	19 51
60	18 47	19 13	19 32	19 47
58	18 34	19 04	19 26	19 45
56	18 23	18 56	19 21	19 42
54	18 13	18 48	19 16	19 40
52	18 05	18 42	19 12	19 38
50	17 57	18 36	19 08	19 36
45	17 40	18 23	19 00	19 32
40	17 27	18 12	18 53	19 29
35	17 15	18 03	18 46	19 26
30	17 05	17 55	18 41	19 23
20	16 47	17 41	18 32	19 18
10	16 31	17 29	18 23	19 14
0	16 17	17 17	18 15	19 10
10	16 02	17 05	18 07	19 06
20	15 46	16 53	17 59	19 02
30	15 28	16 38	17 49	18 57
35	15 18	16 30	17 43	18 54
40	15 05	16 20	17 36	18 51
45	14 51	16 09	17 28	18 47
50	14 33	15 55	17 19	18 43
52	14 25	15 48	17 15	18 41
54	14 16	15 41	17 10	18 38
56	14 05	15 33	17 05	18 36
58	13 53	15 24	16 59	18 33
60	13 39	15 13	16 52	18 30

DAY	GMT of Transit Meridian of Greenwich Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
4	10 02	9 08	2 54	13 38	18 44
5	11 03	9 07	2 51	13 35	18 40
6	12 02	9 06	2 47	13 32	18 36
7	12 58	9 05	2 43	13 29	18 33

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.1	0.3	0.3
30	0.1	0.2	0.3
45	0.1	0.2	0.2
60	0.1	0.1	0.1
75	0.1	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	4	5	6
°	′	′	′
0	20.6	21.0	20.9
4	20.6	21.0	20.9
8	20.6	21.0	20.8
12	20.5	20.9	20.8
16	20.4	20.8	20.7
20	20.4	20.7	20.6
24	20.2	20.6	20.5
28	20.1	20.4	20.3
32	20.0	20.3	20.2
36	19.8	20.1	20.0
40	19.6	19.9	19.8
44	19.4	19.7	19.6
48	19.2	19.5	19.4
52	19.0	19.2	19.2
56	18.8	19.0	18.9
60	18.5	18.7	18.7
64	18.3	18.5	18.4
68	18.0	18.2	18.1
72	17.7	17.9	17.9
76	17.5	17.6	17.6
80	17.2	17.3	17.3
84	16.9	17.0	17.0
88	16.7	16.8	16.8
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	4	5	6
°	′	′	′
0	12.6	12.4	12.5
4	12.7	12.5	12.5
8	12.7	12.5	12.6
12	12.8	12.5	12.6
16	12.8	12.6	12.7
20	12.9	12.7	12.8
24	13.0	12.9	12.9
28	13.2	13.0	13.1
32	13.3	13.2	13.2
36	13.5	13.3	13.4
40	13.7	13.5	13.6
44	13.9	13.7	13.8
48	14.1	14.0	14.0
52	14.3	14.2	14.2
56	14.5	14.4	14.5
60	14.8	14.7	14.7
64	15.0	15.0	15.0
68	15.3	15.2	15.3
72	15.5	15.5	15.5
76	15.8	15.8	15.8
80	16.1	16.1	16.1
84	16.4	16.4	16.4
88	16.6	16.6	16.6
90			

Subtract from table, back cover

New Moon 6

GMT	♈ GHA	VENUS −4.2 GHA	Dec.	MARS −2.0 GHA	Dec.	JUPITER −1.3 GHA	Dec.	SATURN 0.7 GHA	Dec	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
7 00	315 29.4	223 43.1	+18 39.0	319 05.6	− 7 51.4	157 23.8	+10 13.7	81 06.5	−17 22.0	172 48.0	74	+ 9 33.7	−128
01	330 31.9	238 43.8	39.1	334 08.0	51.5	172 25.8	13.5	96 08.9	22.1	187 14.4	75	9 20.9	−128
02	345 34.3	253 44.5	39.2	349 10.3	51.5	187 27.7	13.3	111 11.4	22.1	201 40.9	75	9 08.1	−129
03	0 36.8	268 45.2	39.4	4 12.6	51.5	202 29.7	13.1	126 13.8	22.1	216 07.4	76	• 8 55.2	−129
04	15 39.3	283 45.9	39.5	19 14.9	51.6	217 31.7	12.9	141 16.2	22.1	230 34.0	77	8 42.3	−130
05	30 41.7	298 46.6	39.6	34 17.2	51.6	232 33.7	12.7	156 18.7	22.1	245 00.7	77	8 29.3	−130
06	45 44.2	313 47.2	+18 39.8	49 19.5	− 7 51.7	247 35.6	+10 12.5	171 21.1	−17 22.1	259 27.4	78	+ 8 16.3	−131
07	60 46.6	328 47.9	39.9	64 21.8	51.7	262 37.6	12.3	186 23.5	22.2	273 54.2	79	8 03.2	−131
08	75 49.1	343 48.6	40.0	79 24.1	51.8	277 39.6	12.1	201 26.0	22.2	288 21.1	79	7 50.1	−132
09	90 51.6	358 49.3	40.2	94 26.5	51.8	292 41.5	11.9	216 28.4	22.2	302 48.0	80	• 7 36.9	−131
10	105 54.0	13 49.9	40.3	109 28.8	51.9	307 43.5	11.7	231 30.9	22.2	317 15.0	80	7 23.8	−133
11	120 56.5	28 50.6	40.4	124 31.1	51.9	322 45.5	11.6	246 33.3	22.2	331 42.0	81	7 10.5	−132
12	135 59.0	43 51.3	+18 40.6	139 33.4	− 7 51.9	337 47.4	+10 11.4	261 35.7	−17 22.2	346 09.1	82	+ 6 57.3	−133
13	151 01.4	58 52.0	40.7	154 35.8	52.0	352 49.4	11.2	276 38.2	22.3	0 36.3	82	6 44.0	−133
14	166 03.9	73 52.6	40.8	169 38.1	52.0	7 51.4	11.0	291 40.6	22.3	15 03.5	82	6 30.7	−134
15	181 06.4	88 53.3	41.0	184 40.4	52.1	22 53.4	10.8	306 43.0	22.3	29 30.7	84	• 6 17.3	−134
16	196 08.8	103 53.9	41.1	199 42.7	52.1	37 55.3	10.6	321 45.5	22.3	43 58.1	83	6 03.9	−134
17	211 11.3	118 54.6	41.2	214 45.1	52.2	52 57.3	10.4	336 47.9	22.3	58 25.4	85	5 50.5	−134
18	226 13.8	133 55.3	+18 41.4	229 47.4	− 7 52.2	67 59.3	+10 10.2	351 50.3	−17 22.4	72 52.9	85	+ 5 37.1	−135
19	241 16.2	148 55.9	41.5	244 49.7	52.3	83 01.2	10.0	6 52.8	22.4	87 20.4	85	5 23.6	−135
20	256 18.7	163 56.6	41.6	259 52.1	52.3	98 03.2	09.8	21 55.2	22.4	101 47.9	86	5 10.1	−135
21	271 21.1	178 57.2	41.8	274 54.4	52.4	113 05.2	09.6	36 57.6	22.4	116 15.5	87	• 4 56.6	−135
22	286 23.6	193 57.9	41.9	289 56.7	52.4	128 07.2	09.4	52 00.1	22.4	130 43.2	87	4 43.1	−135
23	301 26.1	208 58.5	42.0	304 59.1	52.5	143 09.1	09.2	67 02.5	22.4	145 10.9	88	4 29.6	−136
8 00	316 28.5	223 59.2	+18 42.2	320 01.4	− 7 52.5	158 11.1	+10 09.0	82 04.9	−17 22.5	159 38.7	88	+ 4 16.0	−135
01	331 31.0	238 59.8	42.3	335 03.8	52.6	173 13.1	08.8	97 07.4	22.5	174 06.5	89	4 02.5	−136
02	346 33.5	254 00.4	42.4	350 06.1	52.7	188 15.0	08.6	112 09.8	22.5	188 34.4	89	3 48.9	−136
03	1 35.9	269 01.1	42.6	5 08.5	52.7	203 17.0	08.5	127 12.2	22.5	203 02.3	90	• 3 35.3	−136
04	16 38.4	284 01.7	42.7	20 10.8	52.8	218 19.0	08.3	142 14.7	22.5	217 30.3	90	3 21.7	−136
05	31 40.9	299 02.4	42.8	35 13.1	52.8	233 21.0	08.1	157 17.1	22.5	231 58.3	91	3 08.1	−136
06	46 43.3	314 03.0	+18 42.9	50 15.5	− 7 52.9	248 22.9	+10 07.9	172 19.5	−17 22.6	246 26.4	91	+ 2 54.5	−136
07	61 45.8	329 03.6	43.1	65 17.8	52.9	263 24.9	07.7	187 22.0	22.6	260 54.5	91	2 40.9	−136
08	76 48.2	344 04.3	43.2	80 20.2	53.0	278 26.9	07.5	202 24.4	22.6	275 22.6	93	2 27.3	−136
09	91 50.7	359 04.9	43.3	95 22.5	53.0	293 28.8	07.3	217 26.8	22.6	289 50.9	92	• 2 13.7	−136
10	106 53.2	14 05.5	43.5	110 24.9	53.1	308 30.8	07.1	232 29.2	22.6	304 19.1	93	2 00.1	−136
11	121 55.6	29 06.1	43.6	125 27.3	53.2	323 32.8	06.9	247 31.7	22.7	318 47.4	94	1 46.5	−136
12	136 58.1	44 06.8	+18 43.7	140 29.6	− 7 53.2	338 34.7	+10 06.7	262 34.1	−17 22.7	333 15.8	94	+ 1 32.9	−136
13	152 00.6	59 07.4	43.9	155 32.0	53.3	353 36.7	06.5	277 36.5	22.7	347 44.2	94	1 19.3	−136
14	167 03.0	74 08.0	44.0	170 34.3	53.3	8 38.7	06.3	292 39.0	22.7	2 12.6	95	1 05.7	−135
15	182 05.5	89 08.6	44.1	185 36.7	53.4	23 40.7	06.1	307 41.4	22.7	16 41.1	95	• 0 52.2	−136
16	197 08.0	104 09.2	44.2	200 39.1	53.4	38 42.6	05.9	322 43.8	22.8	31 09.6	96	0 38.6	−136
17	212 10.4	119 09.8	44.4	215 41.4	53.5	53 44.6	05.7	337 46.3	22.8	45 38.2	96	0 25.0	−135
18	227 12.9	134 10.5	+18 44.5	230 43.8	− 7 53.6	68 46.6	+10 05.5	352 48.7	−17 22.8	60 06.8	96	+ 0 11.5	−135
19	242 15.4	149 11.1	44.6	245 46.1	53.6	83 48.5	05.4	7 51.1	22.8	74 35.4	97	− 0 02.0	−135
20	257 17.8	164 11.7	44.8	260 48.5	53.7	98 50.5	05.2	22 53.5	22.8	89 04.1	97	0 15.5	−135
21	272 20.3	179 12.3	44.9	275 50.9	53.7	113 52.5	05.0	37 56.0	22.8	103 32.8	98	• 0 29.0	−135
22	287 22.7	194 12.9	45.0	290 53.3	53.8	128 54.4	04.8	52 58.4	22.9	118 01.6	98	0 42.5	−134
23	302 25.2	209 13.5	45.1	305 55.6	53.9	143 56.4	04.6	68 00.8	22.9	132 30.4	98	0 55.9	−135
9 00	317 27.7	224 14.1	+18 45.3	320 58.0	− 7 53.9	158 58.4	+10 04.4	83 03.3	−17 22.9	146 59.2	99	− 1 09.4	−134
01	332 30.1	239 14.7	45.4	336 00.4	54.0	174 00.3	04.2	98 05.7	22.9	161 28.1	99	1 22.8	−134
02	347 32.6	254 15.3	45.5	351 02.7	54.1	189 02.3	04.0	113 08.1	22.9	175 57.0	100	1 36.2	−133
03	2 35.1	269 15.9	45.6	6 05.1	54.1	204 04.3	03.8	128 10.5	23.0	190 26.0	99	• 1 49.5	−133
04	17 37.5	284 16.5	45.8	21 07.5	54.2	219 06.3	03.6	143 13.0	23.0	204 54.9	100	2 02.8	−133
05	32 40.0	299 17.1	45.9	36 09.9	54.3	234 08.2	03.4	158 15.4	23.0	219 23.9	101	2 16.1	−133
06	47 42.5	314 17.7	+18 46.0	51 12.3	− 7 54.3	249 10.2	+10 03.2	173 17.8	−17 23.0	233 53.0	100	− 2 29.4	−132
07	62 44.9	329 18.2	46.1	66 14.6	54.4	264 12.2	03.0	188 20.3	23.0	248 22.0	101	2 42.6	−132
08	77 47.4	344 18.8	46.3	81 17.0	54.5	279 14.1	02.8	203 22.7	23.1	262 51.1	102	2 55.8	−132
09	92 49.9	359 19.4	46.4	96 19.4	54.5	294 16.1	02.6	218 25.1	23.1	277 20.3	101	• 3 09.0	−131
10	107 52.3	14 20.0	46.5	111 21.8	54.6	309 18.1	02.4	233 27.5	23.1	291 49.4	102	3 22.1	−131
11	122 54.8	29 20.6	46.6	126 24.2	54.7	324 20.0	02.2	248 30.0	23.1	306 18.6	102	3 35.2	−131
12	137 57.2	44 21.2	+18 46.8	141 26.6	− 7 54.7	339 22.0	+10 02.1	263 32.4	−17 23.1	320 47.8	103	− 3 48.3	−130
13	152 59.7	59 21.7	46.9	156 29.0	54.8	354 24.0	01.9	278 34.8	23.1	335 17.1	103	4 01.3	−130
14	168 02.2	74 22.3	47.0	171 31.4	54.9	9 25.9	01.7	293 37.2	23.2	349 46.4	103	4 14.3	−130
15	183 04.6	89 22.9	47.1	186 33.8	54.9	24 27.9	01.5	308 39.7	23.2	4 15.7	103	• 4 27.3	−128
16	198 07.1	104 23.4	47.3	201 36.1	55.0	39 29.9	01.3	323 42.1	23.2	18 45.0	103	4 40.1	−129
17	213 09.6	119 24.0	47.4	216 38.5	55.1	54 31.8	01.1	338 44.5	23.2	33 14.3	104	4 53.0	−128
18	228 12.0	134 24.6	+18 47.5	231 40.9	− 7 55.1	69 33.8	+10 00.9	353 46.9	−17 23.2	47 43.7	104	− 5 05.8	−128
19	243 14.5	149 25.2	47.6	246 43.3	55.2	84 35.8	00.7	8 49.4	23.3	62 13.1	104	5 18.6	−127
20	258 17.0	164 25.7	47.8	261 45.7	55.3	99 37.8	00.5	23 51.8	23.3	76 42.5	105	5 31.3	−127
21	273 19.4	179 26.3	47.9	276 48.1	55.4	114 39.7	00.3	38 54.2	23.3	91 12.0	104	• 5 44.0	−126
22	288 21.9	194 26.8	48.0	291 50.5	55.4	129 41.7	10 00.1	53 56.6	23.3	105 41.4	105	5 56.6	−125
23	303 24.3	209 27.4	48.1	306 53.0	55.5	144 43.7	9 59.9	68 59.1	23.3	120 10.9	105	6 09.1	−126
24	318 26.8	224 28.0	+18 48.2	321 55.4	− 7 55.6	159 45.6	+ 9 59.7	84 01.5	−17 23.4	134 40.4	105	− 6 21.7	−124
code	−	+ 6	+ 2	+ 24	− 1	+ 20	− 2	+ 24	▯				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
7 0	178 34.2	+16 29.9
1	193 34.3	29.2
2	208 34.4	28.5
3	223 34.4	27.8
4	238 34.5	27.1
5	253 34.6	26.4
6	268 34.7	+16 25.7
7	283 34.7	25.0
8	298 34.8	24.3
9	313 34.9	23.6
10	328 35.0	22.9
11	343 35.0	22.2
12	358 35.1	+16 21.5
13	13 35.2	20.8
14	28 35.3	20.1
15	43 35.3	19.4
16	58 35.4	18.7
17	73 35.5	18.0
18	88 35.6	+16 17.3
19	103 35.6	16.6
20	118 35.7	15.9
21	133 35.8	15.2
22	148 35.9	14.5
23	163 36.0	13.8
8 0	178 36.0	+16 13.1
1	193 36.1	12.4
2	208 36.2	11.6
3	223 36.3	10.9
4	238 36.4	10.2
5	253 36.4	09.5
6	268 36.5	+16 08.8
7	283 36.6	08.1
8	298 36.7	07.4
9	313 36.8	06.7
10	328 36.8	06.0
11	343 36.9	05.3
12	358 37.0	+16 04.5
13	13 37.1	03.8
14	28 37.2	03.1
15	43 37.2	02.4
16	58 37.3	01.7
17	73 37.4	01.0
18	88 37.5	+16 00.3
19	103 37.6	15 59.5
20	118 37.7	58.8
21	133 37.7	58.1
22	148 37.8	57.4
23	163 37.9	56.7
9 0	178 38.0	+15 56.0
1	193 38.1	55.2
2	208 38.2	54.5
3	223 38.3	53.8
4	238 38.3	53.1
5	253 38.4	52.4
6	268 38.5	+15 51.6
7	283 38.6	50.9
8	298 38.7	50.2
9	313 38.8	49.5
10	328 38.9	48.8
11	343 38.9	48.0
12	358 39.0	+15 47.3
13	13 39.1	46.6
14	28 39.2	45.9
15	43 39.3	45.1
16	58 39.4	44.4
17	73 39.5	43.7
18	88 39.6	+15 43.0
19	103 39.6	42.2
20	118 39.7	41.5
21	133 39.8	40.8
22	148 39.9	40.1
23	163 40.0	39.3
24	178 40.1	+15 38.6
code	—	− 7

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 50.6	−40 28.3
5	Achernar	335 58.2	−57 27.0
30	Acrux	173 57.4	−62 51.8
19	Adhara	255 46.3	−28 54.6
10	Aldebaran	291 38.4	+16 25.4
32	Alioth	166 58.3	+56 11.9
34	Alkaid	153 32.5	+49 32.0
55	Al Na'ir	28 36.7	−47 10.1
15	Alnilam	276 29.8	− 1 13.6
25	Alphard	218 38.3	− 8 28.2
41	Alphecca	126 47.0	+26 51.8
1	Alpheratz	358 27.4	+28 51.1
51	Altair	62 49.5	+ 8 45.4
2	Ankaa	353 57.4	−42 32.1
42	Antares	113 18.4	−26 20.3
37	Arcturus	146 34.6	+19 24.6
43	Atria	108 58.2	−68 57.3
22	Avior	234 36.1	−59 22.2
13	Bellatrix	279 17.9	+ 6 18.7
16	Betelg'se	271 47.6	+ 7 24.0
17	Canopus	264 15.5	−52 40.1
12	Capella	281 37.7	+45 57.2
53	Deneb	50 00.1	+45 07.7
28	Denebola	183 17.3	+14 48.9
4	Diphda	349 38.4	−18 13.2
27	Dubhe	194 44.4	+61 59.2
14	Elnath	279 06.7	+28 34.3
47	Eltanin	91 05.6	+51 29.9
54	Enif	34 28.6	+ 9 40.7
56	Fomalhaut	16 10.6	−29 50.9
31	Gacrux	172 48.8	−56 52.5
29	Gienah	176 36.4	−17 18.2
35	Hadar	149 48.6	−60 10.2
6	Hamal	328 48.8	+23 15.5
48	Kaus Aust.	84 40.0	−34 24.4
40	Kochab	137 18.1	+74 20.3
57	Markab	14 20.5	+14 58.5
8	Menkar	314 59.6	+ 3 55.3
36	Menkent	148 58.0	−36 09.6
24	Miapl'dus	221 49.7	−69 32.4
9	Mirfak	309 41.5	+49 42.3
50	Nunki	76 50.8	−26 21.0
52	Peacock	54 25.7	−56 52.4
21	Pollux	244 20.1	+28 07.9
20	Procyon	245 44.6	+ 5 20.2
46	R'alhague	96 45.8	+12 35.6
26	Regulus	208 29.1	+12 10.8
11	Rigel	281 53.2	− 8 14.9
38	Rigil Kent.	140 50.1	−60 39.8
44	Sabik	103 01.2	−15 40.3
3	Schedar	350 28.8	+56 17.9
45	Shaula	97 19.5	−37 04.5
18	Sirius	259 11.5	−16 39.2
33	Spica	159 16.3	−10 56.2
23	Suhail	223 24.3	−43 15.5
49	Vega	81 07.5	+38 44.8
39	Zub'g'bi	137 52.6	−15 51.8

GMT	Equation of Time (App.—Mean) 7	8	9
h	m s	m s	m s
0	− 5 43.2	− 5 36.0	− 5 28.2
6	− 5 41.5	− 5 34.1	− 5 26.2
12	− 5 39.7	− 5 32.2	− 5 24.1
18	− 5 37.9	− 5 30.2	− 5 22.0
24	− 5 36.0	− 5 28.2	− 5 19.8

N	Lat.	Sunrise	Twlt. begins	Moonrise 7	8	9	10
°	h m	h m	h m	h m	h m	h m	h m
72		1 24	////	4 52	7 06	9 13	11 18
70		2 17	////	5 06	7 10	9 08	11 04
68		2 48	////	5 16	7 13	9 04	10 53
66		3 12	////	5 25	7 15	9 01	10 43
64		3 30	////	5 33	7 17	8 58	10 36
62		3 45	////	5 39	7 19	8 56	10 29
60		3 57	////	5 44	7 20	8 53	10 23
58		4 08	////	5 49	7 22	8 52	10 18
56		4 17	////	5 53	7 23	8 50	10 14
54		4 25	1 19	5 57	7 24	8 49	10 10
52		4 33	1 51	6 00	7 25	8 47	10 06
50		4 39	2 13	6 04	7 26	8 46	10 03
45		4 53	2 52	6 10	7 28	8 43	9 56
40		5 05	3 19	6 16	7 30	8 41	9 50
35		5 15	3 39	6 21	7 31	8 39	9 45
30		5 23	3 54	6 25	7 32	8 38	9 41
20		5 38	4 18	6 32	7 35	8 35	9 34
10		5 50	4 36	6 38	7 37	8 33	9 27
0		6 02	4 50	6 44	7 38	8 30	9 21
10		6 14	5 02	6 50	7 40	8 28	9 15
20		6 26	5 12	6 57	7 42	8 26	9 08
30		6 40	5 19	7 04	7 45	8 23	9 01
35		6 48	5 23	7 08	7 46	8 22	8 57
40		6 57	5 25	7 13	7 47	8 20	8 52
45		7 08	5 28	7 18	7 49	8 18	8 47
50		7 20	5 31	7 25	7 51	8 16	8 41
52		7 26	5 32	7 28	7 52	8 15	8 38
54		7 33	5 33	7 31	7 53	8 14	8 34
56		7 40	5 33	7 35	7 54	8 13	8 31
58		7 48	5 34	7 39	7 56	8 11	8 27
60		7 58	5 35	7 43	7 57	8 10	8 23
S							

N	Lat.	Sunset	Twlt. ends	Moonset 7	8	9	10
°		h m	h m	h m	h m	h m	h m
72		22 38	////	20 15	19 59	19 42	19 24
70		21 49	////	20 08	19 59	19 50	19 40
68		21 19	////	20 03	20 00	19 56	19 53
66		20 57	////	19 58	20 00	20 01	20 04
64		20 39	////	19 54	20 00	20 06	20 13
62		20 24	////	19 51	20 00	20 10	20 20
60		20 12	////	19 47	20 01	20 13	20 27
58		20 02	////	19 45	20 01	20 17	20 33
56		19 53	23 48	19 42	20 01	20 19	20 39
54		19 45	22 46	19 40	20 01	20 22	20 43
52		19 37	22 15	19 38	20 01	20 24	20 48
50		19 31	21 54	19 36	20 02	20 26	20 52
45		19 17	21 16	19 32	20 02	20 31	21 00
40		19 06	20 51	19 29	20 02	20 35	21 07
35		18 56	20 31	19 26	20 02	20 38	21 14
30		18 48	20 16	19 23	20 02	20 41	21 19
20		18 33	19 51	19 18	20 03	20 46	21 29
10		18 21	19 34	19 14	20 03	20 50	21 37
0		18 09	19 20	19 10	20 03	20 54	21 45
10		17 58	19 10	19 06	20 03	20 59	21 53
20		17 45	19 00	19 02	20 04	21 03	22 01
30		17 32	18 54	18 57	20 04	21 08	22 11
35		17 24	18 50	18 54	20 04	21 11	22 16
40		17 15	18 47	18 51	20 04	21 14	22 23
45		17 04	18 44	18 47	20 04	21 18	22 30
50		16 52	18 43	18 43	20 04	21 23	22 39
52		16 46	18 42	18 41	20 04	21 25	22 43
54		16 39	18 41	18 38	20 04	21 27	22 47
56		16 32	18 40	18 36	20 04	21 30	22 53
58		16 24	18 40	18 33	20 04	21 33	22 58
60		16 15	18 40	18 30	20 04	21 36	23 05
S							

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
7	12 58	9 05	2 43	13 29	18 33
8	13 51	9 04	2 40	13 26	18 29
9	14 42	9 03	2 36	13 22	18 25
10	15 33	9 02	2 32	13 19	18 21

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.1	0.3	0.3
30	0.1	0.2	0.3
45	0.1	0.2	0.2
60	0.1	0.1	0.1
75	0.1	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	7	8	9
°	′	′	′
0	20.5	19.6	18.6
4	20.5	19.6	18.6
8	20.5	19.6	18.6
12	20.4	19.5	18.5
16	20.3	19.5	18.5
20	20.2	19.4	18.4
24	20.1	19.3	18.4
28	20.0	19.2	18.3
32	19.8	19.1	18.2
36	19.7	18.9	18.1
40	19.5	18.8	18.0
44	19.3	18.6	17.9
48	19.1	18.5	17.7
52	18.9	18.3	17.6
56	18.7	18.1	17.5
60	18.4	17.9	17.3
64	18.2	17.7	17.2
68	17.9	17.5	17.0
72	17.7	17.3	16.9
76	17.4	17.1	16.7
80	17.2	16.9	16.5
84	16.9	16.6	16.4
88	16.7	16.5	16.2
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	7	8	9
°	′	′	′
0	12.7	13.2	13.8
4	12.7	13.2	13.8
8	12.8	13.3	13.8
12	12.8	13.3	13.9
16	12.9	13.4	13.9
20	13.0	13.5	14.0
24	13.1	13.5	14.0
28	13.2	13.6	14.1
32	13.4	13.8	14.2
36	13.5	13.9	14.3
40	13.7	14.0	14.4
44	13.9	14.2	14.5
48	14.1	14.4	14.7
52	14.3	14.5	14.8
56	14.5	14.7	14.9
60	14.8	14.9	15.1
64	15.0	15.1	15.2
68	15.3	15.3	15.4
72	15.5	15.5	15.5
76	15.8	15.8	15.7
80	16.1	16.0	15.9
84	16.3	16.2	16.0
88	16.5	16.4	16.2
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −4.1 GHA	Dec	MARS −2.1 GHA	Dec	JUPITER −1.3 GHA	Dec	SATURN 0.7 GHA	Dec	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
10 00	318 26.8	224 28.0	+18 48.2	321 55.4	− 7 55.6	159 45.6	+ 9 59.7	84 01.5	−17 23.4	134 40.4	105	− 6 21.7	−124
01	333 29.3	239 28.5	48.4	336 57.8	55.7	174 47.6	59.5	99 03.9	23.4	149 09.9	106	6 34.1	−124
02	348 31.7	254 29.1	48.5	352 00.2	55.7	189 49.6	59.3	114 06.3	23.4	163 39.5	105	6 46.5	−124
03	3 34.2	269 29.6	·· 48.6	7 02.6	·· 55.8	204 51.5	·· 59.1	129 08.8	·· 23.4	178 09.0	106	· 6 58.9	−123
04	18 36.7	284 30.2	48.7	22 05.0	55.9	219 53.5	58.9	144 11.2	23.4	192 38.6	106	7 11.2	−122
05	33 39.1	299 30.7	48.8	37 07.4	56.0	234 55.5	58.7	159 13.6	23.5	207 08.2	106	7 23.4	−122
06	48 41.6	314 31.3	+18 49.0	52 09.8	− 7 56.0	249 57.4	+ 9 58.5	174 16.0	−17 23.5	221 37.8	106	− 7 35.6	−122
07	63 44.1	329 31.8	49.1	67 12.2	56.1	264 59.4	58.3	189 18.5	23.5	236 07.4	106	7 47.8	−120
08	78 46.5	344 32.3	49.2	82 14.6	56.2	280 01.4	58.2	204 20.9	23.5	250 37.0	107	7 59.8	−120
09	93 49.0	359 32.9	·· 49.3	97 17.1	·· 56.3	295 03.3	·· 58.0	219 23.3	·· 23.5	265 06.7	107	· 8 11.8	−120
10	108 51.5	14 33.4	49.4	112 19.5	56.3	310 05.3	57.8	234 25.7	23.6	279 36.4	106	8 23.8	−119
11	123 53.9	29 34.0	49.6	127 21.9	56.4	325 07.3	57.6	249 28.2	23.6	294 06.0	107	8 35.7	−118
12	138 56.4	44 34.5	+18 49.7	142 24.3	− 7 56.5	340 09.2	+ 9 57.4	264 30.6	−17 23.6	308 35.7	107	− 8 47.5	−117
13	153 58.8	59 35.0	49.8	157 26.8	56.6	355 11.2	57.2	279 33.0	23.6	323 05.4	108	8 59.2	−117
14	169 01.3	74 35.6	49.9	172 29.2	56.7	10 13.2	57.0	294 35.4	23.6	337 35.2	107	9 10.9	−117
15	184 03.8	89 36.1	·· 50.0	187 31.6	·· 56.7	25 15.2	·· 56.8	309 37.8	·· 23.7	352 04.9	107	· 9 22.6	−115
16	199 06.2	104 36.6	50.1	202 34.0	56.8	40 17.1	56.6	324 40.3	23.7	6 34.6	108	9 34.1	−115
17	214 08.7	119 37.2	50.3	217 36.5	56.9	55 19.1	56.4	339 42.7	23.7	21 04.4	107	9 45.6	−114
18	229 11.2	134 37.7	+18 50.4	232 38.9	− 7 57.0	70 21.1	+ 9 56.2	354 45.1	−17 23.7	35 34.1	108	− 9 57.0	−114
19	244 13.6	149 38.2	50.5	247 41.3	57.1	85 23.0	56.0	9 47.5	23.7	50 03.9	107	10 08.4	−113
20	259 16.1	164 38.7	50.6	262 43.8	57.1	100 25.0	55.8	24 49.9	23.8	64 33.6	108	10 19.7	−112
21	274 18.6	179 39.3	·· 50.7	277 46.2	·· 57.2	115 27.0	·· 55.6	39 52.4	·· 23.8	79 03.4	108	· 10 30.9	−111
22	289 21.0	194 39.8	50.8	292 48.6	57.3	130 28.9	55.4	54 54.8	23.8	93 33.2	108	10 42.0	−111
23	304 23.5	209 40.3	51.0	307 51.1	57.4	145 30.9	55.2	69 57.2	23.8	108 03.0	108	10 53.1	−110
11 00	319 26.0	224 40.8	+18 51.1	322 53.5	− 7 57.5	160 32.9	+ 9 55.0	84 59.6	−17 23.8	122 32.8	108	−11 04.1	−109
01	334 28.4	239 41.3	51.2	337 55.9	57.6	175 34.8	54.8	100 02.0	23.9	137 02.6	108	11 15.0	−108
02	349 30.9	254 41.8	51.3	352 58.4	57.6	190 36.8	54.6	115 04.5	23.9	151 32.4	108	11 25.8	−108
03	4 33.3	269 42.3	·· 51.4	8 00.8	·· 57.7	205 38.8	·· 54.4	130 06.9	·· 23.9	166 02.2	109	· 11 36.6	−107
04	19 35.8	284 42.8	51.5	23 03.3	57.8	220 40.7	54.2	145 09.3	23.9	180 32.1	108	11 47.3	−106
05	34 38.3	299 43.4	51.6	38 05.7	57.9	235 42.7	54.1	160 11.7	23.9	195 01.9	108	11 57.9	−105
06	49 40.7	314 43.9	+18 51.8	53 08.2	− 7 58.0	250 44.7	+ 9 53.9	175 14.1	−17 24.0	209 31.7	109	−12 08.4	−105
07	64 43.2	329 44.4	51.9	68 10.6	58.1	265 46.6	53.7	190 16.6	24.0	224 01.6	108	12 18.9	−104
08	79 45.7	344 44.9	52.0	83 13.1	58.2	280 48.6	53.5	205 19.0	24.0	238 31.4	108	12 29.3	−103
09	94 48.1	359 45.4	·· 52.1	98 15.5	·· 58.2	295 50.6	·· 53.3	220 21.4	·· 24.0	253 01.2	109	· 12 39.6	−102
10	109 50.6	14 45.9	52.2	113 18.0	58.3	310 52.5	53.1	235 23.8	24.1	267 31.1	108	12 49.8	−101
11	124 53.1	29 46.4	52.3	128 20.4	58.4	325 54.5	52.9	250 26.2	24.1	282 00.9	109	12 59.9	−101
12	139 55.5	44 46.9	+18 52.4	143 22.9	− 7 58.5	340 56.5	+ 9 52.7	265 28.7	−17 24.1	296 30.8	108	−13 10.0	− 99
13	154 58.0	59 47.3	52.5	158 25.3	58.6	355 58.4	52.5	280 31.1	24.1	311 00.6	109	13 19.9	− 99
14	170 00.4	74 47.8	52.7	173 27.8	58.7	11 00.4	52.3	295 33.5	24.1	325 30.5	108	13 29.8	− 98
15	185 02.9	89 48.3	·· 52.8	188 30.2	·· 58.8	26 02.4	·· 52.1	310 35.9	·· 24.2	340 00.3	109	· 13 39.6	− 97
16	200 05.4	104 48.8	52.9	203 32.7	58.9	41 04.3	51.9	325 38.3	24.2	354 30.2	108	13 49.3	− 97
17	215 07.8	119 49.3	53.0	218 35.2	59.0	56 06.3	51.7	340 40.7	24.2	9 00.0	109	13 59.0	− 95
18	230 10.3	134 49.8	+18 53.1	233 37.6	− 7 59.0	71 08.3	+ 9 51.5	355 43.2	−17 24.2	23 29.9	108	−14 08.5	− 95
19	245 12.8	149 50.3	53.2	248 40.1	59.1	86 10.2	51.3	10 45.6	24.2	37 59.7	108	14 18.0	− 94
20	260 15.2	164 50.7	53.3	263 42.6	59.2	101 12.2	51.1	25 48.0	24.3	52 29.5	109	14 27.4	− 92
21	275 17.7	179 51.2	·· 53.4	278 45.0	·· 59.3	116 14.2	·· 50.9	40 50.4	·· 24.3	66 59.4	108	· 14 36.6	− 92
22	290 20.2	194 51.7	53.5	293 47.5	59.4	131 16.1	50.7	55 52.8	24.3	81 29.2	109	14 45.8	− 91
23	305 22.6	209 52.2	53.6	308 50.0	59.5	146 18.1	50.5	70 55.2	24.3	95 59.1	108	14 54.9	− 91
12 00	320 25.1	224 52.7	+18 53.7	323 52.4	− 7 59.6	161 20.1	+ 9 50.3	85 57.7	−17 24.4	110 28.9	109	−15 04.0	− 89
01	335 27.6	239 53.1	53.9	338 54.9	59.7	176 22.0	50.1	101 00.1	24.4	124 58.8	108	15 12.9	− 88
02	350 30.0	254 53.6	54.0	353 57.4	59.8	191 24.0	49.9	116 02.5	24.4	139 28.6	108	15 21.7	− 88
03	5 32.5	269 54.1	·· 54.1	8 59.9	· 7 59.9	206 26.0	·· 49.7	131 04.9	·· 24.4	153 58.4	109	· 15 30.5	− 86
04	20 34.9	284 54.5	54.2	24 02.3	8 00.0	221 27.9	49.5	146 07.3	24.4	168 28.3	108	15 39.1	− 86
05	35 37.4	299 55.0	54.3	39 04.8	00.1	236 29.9	49.3	161 09.7	24.5	182 58.1	108	15 47.7	− 85
06	50 39.9	314 55.5	+18 54.4	54 07.3	− 8 00.2	251 31.9	+ 9 49.2	176 12.2	−17 24.5	197 27.9	109	−15 56.2	− 83
07	65 42.3	329 55.9	54.5	69 09.8	00.3	266 33.8	49.0	191 14.6	24.5	211 57.8	108	16 04.5	− 83
08	80 44.8	344 56.4	54.6	84 12.2	00.4	281 35.8	48.8	206 17.0	24.5	226 27.6	108	16 12.8	− 82
09	95 47.3	359 56.9	·· 54.7	99 14.7	·· 00.5	296 37.8	·· 48.6	221 19.4	·· 24.5	240 57.4	108	· 16 21.0	− 81
10	110 49.7	14 57.3	54.8	114 17.2	00.6	311 39.7	48.4	236 21.8	24.6	255 27.2	108	16 29.1	− 80
11	125 52.2	29 57.8	54.9	129 19.7	00.7	326 41.7	48.2	251 24.2	24.6	269 57.0	109	16 37.1	− 79
12	140 54.7	44 58.2	+18 55.0	144 22.2	− 8 00.8	341 43.7	+ 9 48.0	266 26.6	−17 24.6	284 26.9	108	−16 45.0	− 78
13	155 57.1	59 58.7	55.1	159 24.7	00.9	356 45.6	47.8	281 29.1	24.6	298 56.7	108	16 52.8	− 77
14	170 59.6	74 59.1	55.2	174 27.2	01.0	11 47.6	47.6	296 31.5	24.7	313 26.5	108	17 00.5	− 76
15	186 02.1	89 59.6	·· 55.3	189 29.7	·· 01.1	26 49.6	·· 47.4	311 33.9	·· 24.7	327 56.3	108	· 17 08.1	− 76
16	201 04.5	105 00.0	55.4	204 32.2	01.2	41 51.5	47.2	326 36.3	24.7	342 26.1	108	17 15.7	− 74
17	216 07.0	120 00.5	55.5	219 34.7	01.3	56 53.5	47.0	341 38.7	24.7	356 55.9	108	17 23.1	− 73
18	231 09.4	135 00.9	+18 55.6	234 37.1	− 8 01.4	71 55.5	+ 9 46.8	356 41.1	−17 24.7	11 25.7	107	−17 30.4	− 72
19	246 11.9	150 01.4	55.7	249 39.6	01.5	86 57.4	46.6	11 43.5	24.8	25 55.4	108	17 37.6	− 72
20	261 14.4	165 01.8	55.8	264 42.1	01.6	101 59.4	46.4	26 45.9	24.8	40 25.2	108	17 44.8	− 70
21	276 16.8	180 02.2	·· 55.9	279 44.6	·· 01.7	117 01.4	·· 46.2	41 48.4	·· 24.8	54 55.0	108	· 17 51.8	− 69
22	291 19.3	195 02.7	56.0	294 47.1	01.8	132 03.3	46.0	56 50.8	24.8	69 24.8	108	17 58.7	− 69
23	306 21.8	210 03.1	56.1	309 49.6	01.9	147 05.3	45.8	71 53.2	24.9	83 54.6	107	18 05.6	− 67
24	321 24.2	225 03.6	+18 56.2	324 52.2	− 8 02.0	162 07.3	+ 9 45.6	86 55.6	−17 24.9	98 24.3	108	−18 12.3	− 66
code	−	+ 4	+ 1	+ 24	− 1	+ 19	− 2	+ 24	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
10 0	178 40.1	+15 38.6
1	193 40.2	37.9
2	208 40.3	37.1
3	223 40.4	36.4
4	238 40.5	35.7
5	253 40.6	34.9
6	268 40.6	+15 34.2
7	283 40.7	33.5
8	298 40.8	32.7
9	313 40.9	32.0
10	328 41.0	31.3
11	343 41.1	30.6
12	358 41.2	+15 29.8
13	13 41.3	29.1
14	28 41.4	28.3
15	43 41.5	27.6
16	58 41.6	26.9
17	73 41.7	26.1
18	88 41.8	+15 25.4
19	103 41.9	24.7
20	118 42.0	23.9
21	133 42.1	23.2
22	148 42.2	22.5
23	163 42.3	21.7
11 0	178 42.4	+15 21.0
1	193 42.5	20.2
2	208 42.5	19.5
3	223 42.6	18.8
4	238 42.7	18.0
5	253 42.8	17.3
6	268 42.9	+15 16.5
7	283 43.0	15.8
8	298 43.1	15.1
9	313 43.2	14.3
10	328 43.3	13.6
11	343 43.4	12.8
12	358 43.5	+15 12.1
13	13 43.6	11.3
14	28 43.7	10.6
15	43 43.8	09.8
16	58 43.9	09.1
17	73 44.0	08.4
18	88 44.1	+15 07.6
19	103 44.2	06.9
20	118 44.3	06.1
21	133 44.4	05.4
22	148 44.5	04.6
23	163 44.6	03.9
12 0	178 44.8	+15 03.1
1	193 44.9	02.4
2	208 45.0	01.6
3	223 45.1	00.9
4	238 45.2	15 00.1
5	253 45.3	14 59.4
6	268 45.4	+14 58.6
7	283 45.5	57.9
8	298 45.6	57.1
9	313 45.7	56.4
10	328 45.8	55.6
11	343 45.9	54.9
12	358 46.0	+14 54.1
13	13 46.1	53.4
14	28 46.2	52.6
15	43 46.3	51.8
16	58 46.4	51.1
17	73 46.5	50.3
18	88 46.6	+14 49.6
19	103 46.8	48.8
20	118 46.9	48.1
21	133 47.0	47.3
22	148 47.1	46.5
23	163 47.2	45.8
24	178 47.3	+14 45.0
code	—	− 8

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 50.6	−40 28.3
5	Achernar	335 58.2	−57 27.0
30	Acrux	173 57.5	−62 51.8
19	Adhara	255 46.3	−28 54.6
10	Aldebaran	291 38.4	+16 25.4
32	Alioth	166 58.3	+56 11.9
34	Alkaid	153 32.6	+49 32.0
55	Al Na'ir	28 36.7	−47 10.1
15	Alnilam	276 29.8	− 1 13.6
25	Alphard	218 38.3	− 8 28.2
41	Alphecca	126 47.0	+26 51.8
1	Alpheratz	358 27.4	+28 51.1
51	Altair	62 49.5	+ 8 45.4
2	Ankaa	353 57.4	−42 32.1
42	Antares	113 18.4	−26 20.3
37	Arcturus	146 34.7	+19 24.6
43	Atria	108 58.3	−68 57.3
22	Avior	234 36.1	−59 22.2
13	Bellatrix	279 17.9	+ 6 18.7
16	Betelg'se	271 47.6	+ 7 24.0
17	Canopus	264 15.5	−52 40.1
12	Capella	281 37.7	+45 57.2
53	Deneb	50 00.1	+45 07.7
28	Denebola	183 17.3	+14 48.9
4	Diphda	349 38.4	−18 13.2
27	Dubhe	194 44.4	+61 59.2
14	Elnath	279 06.7	+28 34.3
47	Eltanin	91 05.6	+51 29.9
54	Enif	34 28.6	+ 9 40.7
56	Fomalhaut	16 10.6	−29 50.9
31	Gacrux	172 48.8	−56 52.5
29	Gienah	176 36.4	−17 18.1
35	Hadar	149 48.6	−60 10.2
6	Hamal	328 48.8	+23 15.5
48	Kaus Aust.	84 40.0	−34 24.4
40	Kochab	137 18.1	+74 20.3
57	Markab	14 20.5	+14 58.5
8	Menkar	314 59.6	+ 3 55.4
36	Menkent	148 58.0	−36 09.6
24	Miapl'dus	221 49.7	−69 32.4
9	Mirfak	309 41.4	+49 42.3
50	Nunki	76 50.8	−26 21.0
52	Peacock	54 25.7	−56 52.4
21	Pollux	244 20.1	+28 07.9
20	Procyon	245 44.6	+ 5 20.2
46	R'alhague	96 45.8	+12 35.6
26	Regulus	208 29.1	+12 10.8
11	Rigel	281 53.2	− 8 14.9
38	Rigil Kent.	140 50.1	−60 39.8
44	Sabik	103 01.2	−15 40.3
3	Schedar	350 28.8	+56 17.9
45	Shaula	97 19.5	−37 04.5
18	Sirius	259 11.5	−16 39.2
33	Spica	159 16.3	−10 56.2
23	Suhail	223 24.3	−43 15.4
49	Vega	81 07.5	+38 44.8
39	Zub'g'bi	137 52.6	−15 51.8

Lat.	Sunrise	Twlt. begins
N °	h m	h m
72	1 53	////
70	2 34	////
68	3 02	////
66	3 23	////
64	3 39	////
62	3 53	////
60	4 04	////
58	4 14	////
56	4 23	0 50
54	4 30	1 35
52	4 37	2 02
50	4 43	2 22
45	4 57	2 58
40	5 08	3 23
35	5 17	3 42
30	5 25	3 57
20	5 39	4 20
10	5 51	4 38
0	6 02	4 51
10	6 13	5 01
20	6 24	5 10
30	6 37	5 17
35	6 45	5 20
40	6 53	5 22
45	7 03	5 25
50	7 15	5 27
52	7 21	5 27
54	7 27	5 28
56	7 34	5 28
58	7 41	5 28
60	7 50	5 28
S		

Lat.	Sunset	Twlt. ends
N °	h m	h m
72	22 10	////
70	21 31	////
68	21 05	////
66	20 45	////
64	20 29	////
62	20 15	////
60	20 04	////
58	19 54	////
56	19 46	23 09
54	19 39	22 30
52	19 32	22 04
50	19 26	21 45
45	19 13	21 10
40	19 02	20 45
35	18 53	20 27
30	18 45	20 12
20	18 31	19 49
10	18 20	19 33
0	18 08	19 19
10	17 58	19 10
20	17 46	19 01
30	17 33	18 54
35	17 26	18 52
40	17 17	18 49
45	17 07	18 47
50	16 56	18 46
52	16 50	18 45
54	16 44	18 45
56	16 37	18 45
58	16 30	18 45
60	16 21	18 45
S		

Moonrise	10	11	12	13
N °	h m	h m	h m	h m
72	11 18	13 28	16 09	
70	11 04	13 01	15 03	
68	10 53	12 40	14 27	16 14
66	10 43	12 24	14 02	15 34
64	10 36	12 11	13 42	15 07
62	10 29	12 00	13 26	14 46
60	10 23	11 50	13 13	14 30
58	10 18	11 42	13 02	14 15
56	10 14	11 35	12 52	14 03
54	10 10	11 28	12 43	13 53
52	10 06	11 23	12 35	13 43
50	10 03	11 18	12 29	13 35
45	9 56	11 06	12 14	13 17
40	9 50	10 57	12 02	13 02
35	9 45	10 49	11 51	12 50
30	9 41	10 43	11 42	12 40
20	9 34	10 31	11 27	12 21
10	9 27	10 20	11 13	12 06
0	9 21	10 11	11 01	11 51
10	9 15	10 01	10 48	11 36
20	9 08	9 51	10 35	11 20
30	9 01	9 40	10 20	11 02
35	8 57	9 33	10 11	10 52
40	8 52	9 26	10 01	10 40
45	8 47	9 17	9 50	10 26
50	8 41	9 07	9 36	10 09
52	8 38	9 02	9 29	10 01
54	8 34	8 57	9 22	9 52
56	8 31	8 51	9 14	9 42
58	8 27	8 45	9 05	9 31
60	8 23	8 37	8 55	9 18

Moonset	10	11	12	13
N °	h m	h m	h m	h m
72	19 24	18 59	18 02	
70	19 40	19 28	19 10	
68	19 53	19 50	19 47	19 44
66	20 04	20 07	20 13	20 24
64	20 13	20 21	20 33	20 52
62	20 20	20 33	20 50	21 13
60	20 27	20 43	21 04	21 30
58	20 33	20 52	21 15	21 45
56	20 39	21 00	21 26	21 57
54	20 43	21 07	21 35	22 08
52	20 48	21 13	21 43	22 18
50	20 52	21 19	21 50	22 26
45	21 00	21 32	22 06	22 45
40	21 07	21 42	22 19	23 00
35	21 14	21 51	22 30	23 12
30	21 19	21 58	22 40	23 24
20	21 29	22 12	22 56	23 43
10	21 37	22 24	23 11	23 59
0	21 45	22 35	23 25	24 15
10	21 53	22 46	23 38	24 30
20	22 01	22 58	23 53	24 47
30	22 11	23 11	24 10	0 10
35	22 16	23 19	24 20	0 20
40	22 23	23 28	24 31	0 31
45	22 30	23 39	24 44	0 44
50	22 39	23 52	25 00	1 00
52	22 43	23 58	25 08	1 08
54	22 47	24 04	0 04	1 17
56	22 53	24 12	0 12	1 26
58	22 58	24 20	0 20	1 37
60	23 05	24 30	0 30	1 50

GMT	Equation of Time (App.—Mean) 10	11	12
h	m s	m s	m s
0	− 5 19.8	− 5 10.8	− 5 01.2
6	− 5 17.6	− 5 08.4	− 4 58.7
12	− 5 15.4	− 5 06.1	− 4 56.2
18	− 5 13.1	− 5 03.7	− 4 53.6
24	− 5 10.8	− 5 01.2	− 4 51.1

GMT of Transit Meridian of Greenwich	DAY	Moon	Venus	Mars	Jupiter	Saturn
		h m	h m	h m	h m	h m
	10	15 33	9 02	2 32	13 19	18 21
	11	16 23	9 01	2 28	13 16	18 17
	12	17 13	9 00	2 24	13 13	18 13
	13	18 03	9 00	2 20	13 10	18 09

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.1	0.3	0.3
30	0.1	0.2	0.3
45	0.1	0.2	0.2
60	0.1	0.1	0.1
75	0.1	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	10	11	12
°	′	′	′
0	17.5	16.2	15.0
4	17.5	16.2	15.0
8	17.4	16.2	15.0
12	17.4	16.2	15.1
16	17.4	16.2	15.1
20	17.4	16.2	15.1
24	17.3	16.1	15.1
28	17.3	16.1	15.1
32	17.2	16.1	15.1
36	17.1	16.1	15.1
40	17.1	16.1	15.1
44	17.0	16.0	15.2
48	16.9	16.0	15.2
52	16.8	16.0	15.2
56	16.8	16.0	15.2
60	16.7	15.9	15.3
64	16.6	15.9	15.3
68	16.5	15.9	15.3
72	16.4	15.8	15.3
76	16.3	15.8	15.4
80	16.2	15.8	15.4
84	16.1	15.7	15.4
88	16.0	15.7	15.4
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	10	11	12
°	′	′	′
0	14.5	15.2	15.8
4	14.5	15.2	15.8
8	14.5	15.2	15.8
12	14.5	15.2	15.8
16	14.5	15.2	15.8
20	14.6	15.2	15.8
24	14.6	15.2	15.8
28	14.7	15.3	15.8
32	14.7	15.3	15.8
36	14.8	15.3	15.8
40	14.8	15.3	15.7
44	14.9	15.3	15.7
48	15.0	15.4	15.7
52	15.1	15.4	15.7
56	15.2	15.4	15.7
60	15.3	15.5	15.6
64	15.3	15.5	15.6
68	15.4	15.5	15.6
72	15.5	15.5	15.6
76	15.6	15.6	15.5
80	15.8	15.6	15.5
84	15.9	15.7	15.5
88	15.9	15.7	15.4
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −4.1 GHA	VENUS −4.1 Dec.	MARS −2.1 GHA	MARS −2.1 Dec.	JUPITER −1.2 GHA	JUPITER −1.2 Dec.	SATURN 0.7 GHA	SATURN 0.7 Dec	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
13 00	321 24.2	225 03.6	+18 56.2	324 52.2	− 8 02.0	162 07.3	+ 9 45.6	86 55.6	−17 24.9	98 24.3	108	−18 12.3	− 66
01	336 26.7	240 04.0	56.3	339 54.7	02.1	177 09.2	45.4	101 58.0	24.9	112 54.1	108	18 18.9	− 66
02	351 29.2	255 04.4	56.4	354 57.2	02.2	192 11.2	45.2	117 00.4	24.9	127 23.9	107	18 25.5	− 64
03	6 31.6	270 04.9	·· 56.5	9 59.7	·· 02.3	207 13.2	·· 45.0	132 02.8	·· 24.9	141 53.6	108	·18 31.9	− 63
04	21 34.1	285 05.3	56.6	25 02.2	02.4	222 15.1	44.8	147 05.2	25.0	156 23.4	108	18 38.2	− 62
05	36 36.6	300 05.7	56.7	40 04.7	02.5	237 17.1	44.6	162 07.7	25.0	170 53.2	107	18 44.4	− 62
06	51 39.0	315 06.1	+18 56.8	55 07.2	− 8 02.6	252 19.0	+ 9 44.4	177 10.1	−17 25.0	185 22.9	108	−18 50.6	− 60
07	66 41.5	330 06.6	56.9	70 09.7	02.7	267 21.0	44.2	192 12.5	25.0	199 52.7	107	18 56.6	− 59
08	81 43.9	345 07.0	57.0	85 12.2	02.8	282 23.0	44.0	207 14.9	25.1	214 22.4	108	19 02.5	− 58
09	96 46.4	0 07.4	·· 57.1	100 14.7	·· 02.9	297 24.9	·· 43.8	222 17.3	·· 25.1	228 52.2	107	·19 08.3	− 57
10	111 48.9	15 07.8	57.2	115 17.3	03.0	312 26.9	43.6	237 19.7	25.1	243 21.9	108	19 14.0	− 57
11	126 51.3	30 08.2	57.3	130 19.8	03.1	327 28.9	43.5	252 22.1	25.1	257 51.7	107	19 19.7	− 55
12	141 53.8	45 08.7	+18 57.4	145 22.3	− 8 03.2	342 30.8	+ 9 43.3	267 24.5	−17 25.2	272 21.4	107	−19 25.2	− 54
13	156 56.3	60 09.1	57.5	160 24.8	03.4	357 32.8	43.1	282 26.9	25.2	286 51.1	108	19 30.6	− 53
14	171 58.7	75 09.5	57.6	175 27.3	03.5	12 34.8	42.9	297 29.3	25.2	301 20.9	107	19 35.9	− 52
15	187 01.2	90 09.9	·· 57.7	190 29.9	·· 03.6	27 36.7	·· 42.7	312 31.8	·· 25.2	315 50.6	108	·19 41.1	− 51
16	202 03.7	105 10.3	57.8	205 32.4	03.7	42 38.7	42.5	327 34.2	25.2	330 20.4	107	19 46.2	− 49
17	217 06.1	120 10.7	57.9	220 34.9	03.8	57 40.7	42.3	342 36.6	25.3	344 50.1	107	19 51.1	− 49
18	232 08.6	135 11.1	+18 58.0	235 37.5	− 8 03.9	72 42.6	+ 9 42.1	357 39.0	−17 25.3	359 19.8	108	−19 56.0	− 48
19	247 11.0	150 11.5	58.1	250 40.0	04.0	87 44.6	41.9	12 41.4	25.3	13 49.6	107	20 00.8	− 47
20	262 13.5	165 11.9	58.1	265 42.5	04.1	102 46.6	41.7	27 43.8	25.3	28 19.3	108	20 05.5	− 46
21	277 16.0	180 12.3	·· 58.2	280 45.0	·· 04.2	117 48.5	·· 41.5	42 46.2	·· 25.4	42 49.1	107	·20 10.1	− 44
22	292 18.4	195 12.7	58.3	295 47.6	04.4	132 50.5	41.3	57 48.6	25.4	57 18.8	107	20 14.5	− 44
23	307 20.9	210 13.1	58.4	310 50.1	04.5	147 52.5	41.1	72 51.0	25.4	71 48.5	108	20 18.9	− 42
14 00	322 23.4	225 13.5	+18 58.5	325 52.7	− 8 04.6	162 54.4	+ 9 40.9	87 53.4	−17 25.4	86 18.3	107	−20 23.1	− 42
01	337 25.8	240 13.9	58.6	340 55.2	04.7	177 56.4	40.7	102 55.8	25.5	100 48.0	108	20 27.3	− 40
02	352 28.3	255 14.3	58.7	355 57.7	04.8	192 58.4	40.5	117 58.2	25.5	115 17.8	107	20 31.3	− 40
03	7 30.8	270 14.7	·· 58.8	11 00.3	·· 04.9	208 00.3	·· 40.3	133 00.7	·· 25.5	129 47.5	108	·20 35.3	− 38
04	22 33.2	285 15.1	58.9	26 02.8	05.0	223 02.3	40.1	148 03.1	25.5	144 17.3	107	20 39.1	− 37
05	37 35.7	300 15.5	59.0	41 05.4	05.2	238 04.2	39.9	163 05.5	25.5	158 47.0	108	20 42.8	− 36
06	52 38.2	315 15.9	+18 59.1	56 07.9	− 8 05.3	253 06.2	+ 9 39.7	178 07.9	−17 25.6	173 16.8	107	−20 46.4	− 35
07	67 40.6	330 16.3	59.1	71 10.4	05.4	268 08.2	39.5	193 10.3	25.6	187 46.5	108	20 49.9	− 34
08	82 43.1	345 16.7	59.2	86 13.0	05.5	283 10.1	39.3	208 12.7	25.6	202 16.3	108	20 53.3	− 33
09	97 45.5	0 17.0	·· 59.3	101 15.5	·· 05.6	298 12.1	·· 39.1	223 15.1	·· 25.6	216 46.1	108	·20 56.6	− 32
10	112 48.0	15 17.4	59.4	116 18.1	05.7	313 14.1	38.9	238 17.5	25.7	231 15.9	107	20 59.8	− 31
11	127 50.5	30 17.8	59.5	131 20.6	05.8	328 16.0	38.7	253 19.9	25.7	245 45.6	108	21 02.9	− 30
12	142 52.9	45 18.2	+18 59.6	146 23.2	− 8 06.0	343 18.0	+ 9 38.5	268 22.3	−17 25.7	260 15.4	108	−21 05.9	− 29
13	157 55.4	60 18.6	59.7	161 25.8	06.1	358 20.0	38.3	283 24.7	25.7	274 45.2	108	21 08.8	− 27
14	172 57.9	75 18.9	59.7	176 28.3	06.2	13 21.9	38.1	298 27.1	25.8	289 15.0	108	21 11.5	− 27
15	188 00.3	90 19.3	·· 59.8	191 30.9	·· 06.3	28 23.9	·· 37.9	313 29.5	·· 25.8	303 44.8	108	·21 14.2	− 25
16	203 02.8	105 19.7	18 59.9	206 33.4	06.4	43 25.9	37.7	328 31.9	25.8	318 14.6	109	21 16.7	− 25
17	218 05.3	120 20.1	19 00.0	221 36.0	06.6	58 27.8	37.5	343 34.3	25.8	332 44.5	108	21 19.2	− 23
18	233 07.7	135 20.4	+19 00.1	236 38.5	− 8 06.7	73 29.8	+ 9 37.3	358 36.7	−17 25.9	347 14.3	108	−21 21.5	− 23
19	248 10.2	150 20.8	00.2	251 41.1	06.8	88 31.8	37.1	13 39.2	25.9	1 44.1	109	21 23.8	− 21
20	263 12.7	165 21.2	00.2	266 43.7	06.9	103 33.7	36.9	28 41.6	25.9	16 14.0	108	21 25.9	− 20
21	278 15.1	180 21.5	·· 00.3	281 46.2	·· 07.0	118 35.7	·· 36.7	43 44.0	·· 25.9	30 43.8	109	·21 27.9	− 19
22	293 17.6	195 21.9	00.4	296 48.8	07.2	133 37.6	36.5	58 46.4	26.0	45 13.7	109	21 29.8	− 18
23	308 20.0	210 22.3	00.5	311 51.4	07.3	148 39.6	36.3	73 48.8	26.0	59 43.6	109	21 31.6	− 17
15 00	323 22.5	225 22.6	+19 00.6	326 53.9	− 8 07.4	163 41.6	+ 9 36.1	88 51.2	−17 26.0	74 13.5	109	−21 33.3	− 16
01	338 25.0	240 23.0	00.7	341 56.5	07.5	178 43.5	35.9	103 53.6	26.0	88 43.4	109	21 34.9	− 15
02	353 27.4	255 23.3	00.7	356 59.1	07.7	193 45.5	35.7	118 56.0	26.0	103 13.3	109	21 36.4	− 14
03	8 29.9	270 23.7	·· 00.8	12 01.7	·· 07.8	208 47.5	·· 35.6	133 58.4	·· 26.1	117 43.2	109	·21 37.8	− 13
04	23 32.4	285 24.1	00.9	27 04.2	07.9	223 49.4	35.4	149 00.8	26.1	132 13.1	110	21 39.1	− 11
05	38 34.8	300 24.4	01.0	42 06.8	08.0	238 51.4	35.2	164 03.2	26.1	146 43.1	109	21 40.2	− 11
06	53 37.3	315 24.8	+19 01.1	57 09.4	− 8 08.2	253 53.4	+ 9 35.0	179 05.6	−17 26.1	161 13.0	110	−21 41.3	− 9
07	68 39.8	330 25.1	01.1	72 12.0	08.3	268 55.3	34.8	194 08.0	26.2	175 43.0	110	21 42.2	− 9
08	83 42.2	345 25.5	01.2	87 14.5	08.4	283 57.3	34.6	209 10.4	26.2	190 13.0	110	21 43.1	− 7
09	98 44.7	0 25.8	·· 01.3	102 17.1	·· 08.5	298 59.2	·· 34.4	224 12.8	·· 26.2	204 43.0	110	·21 43.8	− 7
10	113 47.1	15 26.2	01.4	117 19.7	08.7	314 01.2	34.2	239 15.2	26.2	219 13.0	110	21 44.5	− 5
11	128 49.6	30 26.5	01.4	132 22.3	08.8	329 03.2	34.0	254 17.6	26.3	233 43.0	111	21 45.0	− 4
12	143 52.1	45 26.8	+19 01.5	147 24.9	− 8 08.9	344 05.1	+ 9 33.8	269 20.0	−17 26.3	248 13.1	110	−21 45.4	− 3
13	158 54.5	60 27.2	01.6	162 27.5	09.0	359 07.1	33.6	284 22.4	26.3	262 43.1	111	21 45.7	− 3
14	173 57.0	75 27.5	01.7	177 30.0	09.2	14 09.1	33.4	299 24.8	26.3	277 13.2	111	21 46.0	− 1
15	188 59.5	90 27.9	·· 01.7	192 32.6	·· 09.3	29 11.0	·· 33.2	314 27.2	·· 26.4	291 43.3	111	·21 46.1	0
16	204 01.9	105 28.2	01.8	207 35.2	09.4	44 13.0	33.0	329 29.6	26.4	306 13.4	111	21 46.1	+ 1
17	219 04.4	120 28.5	01.9	222 37.8	09.5	59 15.0	32.8	344 32.0	26.4	320 43.5	112	21 46.0	+ 2
18	234 06.9	135 28.9	+19 02.0	237 40.4	− 8 09.7	74 16.9	+ 9 32.6	359 34.4	−17 26.4	335 13.7	112	−21 45.8	+ 3
19	249 09.3	150 29.2	02.0	252 43.0	09.8	89 18.9	32.4	14 36.8	26.5	349 43.9	112	21 45.5	+ 4
20	264 11.8	165 29.5	02.1	267 45.6	09.9	104 20.8	32.2	29 39.2	26.5	4 14.1	112	21 45.1	+ 5
21	279 14.3	180 29.9	·· 02.2	282 48.2	·· 10.1	119 22.8	·· 32.0	44 41.6	·· 26.5	18 44.3	112	·21 44.6	+ 7
22	294 16.7	195 30.2	02.3	297 50.8	10.2	134 24.8	31.8	59 44.0	26.5	33 14.5	112	21 43.9	+ 7
23	309 19.2	210 30.5	02.3	312 53.4	10.3	149 26.7	31.6	74 46.4	26.6	47 44.7	113	21 43.2	+ 8
24	324 21.6	225 30.8	+19 02.4	327 56.0	− 8 10.5	164 28.7	+ 9 31.4	89 48.8	−17 26.6	62 15.0	113	−21 42.4	+ 9
code		+ 4	+ 1	+ 26	− 1	+ 20	− 2	+ 24	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
13 0	178 47.3	+14 45.0
1	193 47.4	44.3
2	208 47.5	43.5
3	223 47.6	42.7
4	238 47.7	42.0
5	253 47.8	41.2
6	268 48.0	+14 40.5
7	283 48.1	39.7
8	298 48.2	38.9
9	313 48.3	38.2
10	328 48.4	37.4
11	343 48.5	36.7
12	358 48.6	+14 35.9
13	13 48.7	35.1
14	28 48.8	34.4
15	43 49.0	33.6
16	58 49.1	32.8
17	73 49.2	32.1
18	88 49.3	+14 31.3
19	103 49.4	30.5
20	118 49.5	29.8
21	133 49.6	29.0
22	148 49.7	28.2
23	163 49.9	27.5
14 0	178 50.0	+14 26.7
1	193 50.1	25.9
2	208 50.2	25.2
3	223 50.3	24.4
4	238 50.4	23.6
5	253 50.6	22.9
6	268 50.7	+14 22.1
7	283 50.8	21.3
8	298 50.9	20.5
9	313 51.0	19.8
10	328 51.1	19.0
11	343 51.3	18.2
12	358 51.4	+14 17.4
13	13 51.5	16.7
14	28 51.6	15.9
15	43 51.7	15.1
16	58 51.8	14.4
17	73 52.0	13.6
18	88 52.1	+14 12.8
19	103 52.2	12.0
20	118 52.3	11.3
21	133 52.4	10.5
22	148 52.6	09.7
23	163 52.7	08.9
15 0	178 52.8	+14 08.1
1	193 52.9	07.4
2	208 53.0	06.6
3	223 53.2	05.8
4	238 53.3	05.0
5	253 53.4	04.2
6	268 53.5	+14 03.5
7	283 53.7	02.7
8	298 53.8	01.9
9	313 53.9	01.1
10	328 54.0	14 00.3
11	343 54.1	13 59.6
12	358 54.3	+13 58.8
13	13 54.4	58.0
14	28 54.5	57.2
15	43 54.6	56.4
16	58 54.8	55.6
17	73 54.9	54.9
18	88 55.0	+13 54.1
19	103 55.1	53.3
20	118 55.3	52.5
21	133 55.4	51.7
22	148 55.5	50.9
23	163 55.6	50.1
24	178 55.8	+13 49.4
code	—	− 7

STARS No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 50.6	−40 28.3
5	Achernar	335 58.1	−57 27.0
30	Acrux	173 57.5	−62 51.8
19	Adhara	255 46.3	−28 54.6
10	Aldebaran	291 38.4	+16 25.4
32	Alioth	166 58.3	+56 11.9
34	Alkaid	153 32.6	+49 32.0
55	Al Na'ir	28 36.7	−47 10.1
15	Alnilam	276 29.8	− 1 13.6
25	Alphard	218 38.3	− 8 28.2
41	Alphecca	126 47.0	+26 51.8
1	Alpheratz	358 27.3	+28 51.2
51	Altair	62 49.5	+ 8 45.4
2	Ankaa	353 57.3	−42 32.1
42	Antares	113 18.4	−26 20.3
37	Arcturus	146 34.7	+19 24.6
43	Atria	108 58.3	−68 57.3
22	Avior	234 36.1	−59 22.2
13	Bellatrix	279 17.9	+ 6 18.7
16	Betelg'se	271 47.6	+ 7 24.1
17	Canopus	264 15.5	−52 40.1
12	Capella	281 37.6	+45 57.2
53	Deneb	50 00.1	+45 07.7
28	Denebola	183 17.3	+14 48.9
4	Diphda	349 38.4	−18 13.2
27	Dubhe	194 44.4	+61 59.2
14	Elnath	279 06.7	+28 34.3
47	Eltanin	91 05.6	+51 29.9
54	Enif	34 28.6	+ 9 40.7
56	Fomalhaut	16 10.5	−29 50.9
31	Gacrux	172 48.8	−56 52.5
29	Gienah	176 36.4	−17 18.1
35	Hadar	149 48.6	−60 10.2
6	Hamal	328 48.8	+23 15.5
48	Kaus Aust.	84 40.0	−34 24.4
40	Kochab	137 18.2	+74 20.3
57	Markab	14 20.5	+14 58.5
8	Menkar	314 59.6	+ 3 55.4
36	Menkent	148 58.0	−36 09.6
24	Miapl'dus	221 49.7	−69 32.4
9	Mirfak	309 41.4	+49 42.4
50	Nunki	76 50.8	−26 21.0
52	Peacock	54 25.7	−56 52.5
21	Pollux	244 20.1	+28 07.9
20	Procyon	245 44.6	+ 5 20.2
46	R'alhague	96 45.8	+12 35.6
26	Regulus	208 29.1	+12 10.8
11	Rigel	281 53.1	− 8 14.9
38	Rigil Kent.	140 50.1	−60 39.7
44	Sabik	103 01.2	−15 40.3
3	Schedar	350 28.8	+56 17.9
45	Shaula	97 19.5	−37 04.5
18	Sirius	259 11.5	−16 39.2
33	Spica	159 16.3	−10 56.2
23	Suhail	223 24.2	−43 15.4
49	Vega	81 07.5	+38 44.8
39	Zub'g'bi	137 52.6	−15 51.8

GMT	Equation of Time (App. Mean) 13 m s	14 m s	15 m s
h			
0	− 4 51.1	− 4 40.3	− 4 29.0
6	− 4 48.4	− 4 37.6	− 4 26.1
12	− 4 45.8	− 4 34.8	− 4 23.2
18	− 4 43.1	− 4 31.9	− 4 20.2
24	− 4 40.3	− 4 29.0	− 4 17.2

Lat.	Sunrise	Twlt. begins	Moonrise 13	14	15	16
N °	h m	h m	h m	h m	h m	h m
72	2 17	////				
70	2 51	////				
68	3 15	////	16 14	17 57	19 14	19 24
66	3 34	////	15 34	16 56	17 56	18 31
64	3 48	////	15 07	16 22	17 19	17 58
62	4 01	////	14 46	15 57	16 53	17 34
60	4 12	////	14 30	15 37	16 32	17 15
58	4 21	////	14 15	15 21	16 16	16 59
56	4 29	1 15	14 03	15 07	16 01	16 46
54	4 36	1 48	13 53	14 55	15 49	16 34
52	4 42	2 12	13 43	14 45	15 38	16 23
50	4 48	2 29	13 35	14 35	15 29	16 14
45	5 00	3 03	13 17	14 16	15 08	15 55
40	5 10	3 28	13 02	14 00	14 52	15 39
35	5 19	3 45	12 50	13 46	14 38	15 25
30	5 27	4 00	12 40	13 34	14 26	15 13
20	5 40	4 21	12 21	13 14	14 05	14 53
10	5 51	4 38	12 06	12 57	13 47	14 36
0	6 01	4 50	11 51	12 41	13 31	14 20
10	6 11	5 00	11 36	12 25	13 14	14 03
20	6 22	5 08	11 20	12 08	12 56	13 46
30	6 34	5 15	11 02	11 48	12 36	13 26
35	6 41	5 17	10 52	11 36	12 24	13 14
40	6 49	5 19	10 40	11 23	12 10	13 01
45	6 59	5 21	10 26	11 07	11 53	12 45
50	7 10	5 22	10 09	10 48	11 33	12 25
52	7 15	5 22	10 01	10 39	11 24	12 16
54	7 21	5 23	9 52	10 29	11 13	12 05
56	7 27	5 22	9 42	10 18	11 01	11 53
58	7 34	5 22	9 31	10 05	10 47	11 39
60	7 42	5 22	9 18	9 49	10 31	11 23
S						

Lat.	Sunset	Twlt. ends	Moonset 13	14	15	16
N °	h m	h m	h m	h m	h m	h m
72	21 47	////				
70	21 14	////				
68	20 51	////	19 44	19 45	20 12	21 43
66	20 33	////	20 24	20 47	21 30	22 36
64	20 18	////	20 52	21 21	22 07	23 09
62	20 06	////	21 13	21 46	22 33	23 32
60	19 56	////	21 30	22 06	22 53	23 51
58	19 47	////	21 45	22 23	23 10	24 07
56	19 39	22 47	21 57	22 36	23 24	24 20
54	19 32	22 15	22 08	22 48	23 36	24 32
52	19 26	21 53	22 18	22 59	23 47	24 42
50	19 20	21 35	22 26	23 09	23 57	24 51
45	19 08	21 03	22 45	23 28	24 17	0 17
40	18 58	20 40	23 00	23 45	24 33	0 33
35	18 50	20 23	23 12	23 58	24 47	0 47
30	18 42	20 08	23 24	24 10	0 10	0 59
20	18 29	19 46	23 43	24 31	0 31	1 20
10	18 18	19 31	23 59	24 48	0 48	1 38
0	18 08	19 19	24 15	0 15	1 05	1 54
10	17 58	19 10	24 30	0 30	1 21	2 11
20	17 47	19 02	24 47	0 47	1 39	2 29
30	17 35	18 56	0 10	1 06	2 00	2 49
35	17 28	18 54	0 20	1 17	2 11	3 01
40	17 20	18 52	0 31	1 30	2 25	3 15
45	17 11	18 50	0 44	1 45	2 41	3 31
50	17 00	18 50	1 00	2 04	3 01	3 51
52	16 55	18 50	1 08	2 13	3 11	4 00
54	16 50	18 50	1 17	2 23	3 21	4 11
56	16 43	18 50	1 26	2 34	3 33	4 23
58	16 36	18 50	1 37	2 47	3 47	4 37
60	16 28	18 51	1 50	3 02	4 04	4 53
S						

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
13	18 03	9 00	2 20	13 10	18 09
14	18 53	8 59	2 16	13 07	18 06
15	19 43	8 58	2 12	13 04	18 02
16	20 31	8 58	2 08	13 00	17 58

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.1	0.2	0.3
30	0.1	0.2	0.3
45	0.1	0.2	0.2
60	0.1	0.1	0.1
75	0.1	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	13	14	15
°	′	′	′
0	14.0	13.3	12.6
4	14.0	13.3	12.6
8	14.0	13.3	12.7
12	14.1	13.3	12.7
16	14.1	13.3	12.7
20	14.1	13.4	12.8
24	14.1	13.4	12.9
28	14.2	13.5	12.9
32	14.2	13.6	13.0
36	14.3	13.6	13.1
40	14.3	13.7	13.2
44	14.4	13.8	13.3
48	14.5	13.9	13.4
52	14.5	14.0	13.6
56	14.6	14.1	13.7
60	14.7	14.2	13.8
64	14.7	14.3	14.0
68	14.8	14.4	14.1
72	14.9	14.6	14.3
76	15.0	14.7	14.4
80	15.1	14.8	14.6
84	15.1	14.9	14.8
88	15.2	15.0	14.9
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	13	14	15
°	′	′	′
0	16.4	16.9	17.2
4	16.4	16.8	17.2
8	16.4	16.8	17.2
12	16.4	16.8	17.2
16	16.4	16.8	17.1
20	16.3	16.7	17.1
24	16.3	16.7	17.0
28	16.3	16.6	16.9
32	16.2	16.6	16.8
36	16.2	16.5	16.7
40	16.1	16.4	16.6
44	16.1	16.3	16.5
48	16.0	16.2	16.4
52	15.9	16.1	16.3
56	15.9	16.0	16.1
60	15.8	15.9	16.0
64	15.7	15.8	15.9
68	15.6	15.7	15.7
72	15.6	15.6	15.6
76	15.5	15.4	15.4
80	15.4	15.3	15.2
84	15.3	15.2	15.1
88	15.2	15.1	15.0
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −4.1 GHA	VENUS −4.1 Dec.	MARS −2.2 GHA	MARS −2.2 Dec.	JUPITER −1.2 GHA	JUPITER −1.2 Dec.	SATURN 0.7 GHA	SATURN 0.7 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
16 0	324 21.6	225 30.8	+19 02.4	327 56.0	− 8 10.5	164 28.7	+ 9 31.4	89 48.8	−17 26.6	62 15.0	113	−21 42.4	+ 9
1	339 24.1	240 31.2	02.5	342 58.6	10.6	179 30.7	31.2	104 51.2	26.6	76 45.3	113	21 41.5	+ 11
2	354 26.6	255 31.5	02.5	358 01.2	10.7	194 32.6	31.0	119 53.6	26.6	91 15.6	114	21 40.4	+ 11
3	9 29.0	270 31.8	·· 02.6	13 03.8	·· 10.9	209 34.6	·· 30.8	134 56.0	·· 26.7	105 46.0	113	·21 39.3	+ 12
4	24 31.5	285 32.1	02.7	28 06.4	11.0	224 36.6	30.6	149 58.4	26.7	120 16.3	114	21 38.1	+ 14
5	39 34.0	300 32.4	02.7	43 09.0	11.1	239 38.5	30.4	165 00.8	26.7	134 46.7	114	21 36.7	+ 14
6	54 36.4	315 32.8	+19 02.8	58 11.6	− 8 11.3	254 40.5	+ 9 30.2	180 03.2	−17 26.7	149 17.1	114	−21 35.3	+ 16
7	69 38.9	330 33.1	02.9	73 14.2	11.4	269 42.4	30.0	195 05.6	26.8	163 47.5	115	21 33.7	+ 16
8	84 41.4	345 33.4	02.9	88 16.9	11.5	284 44.4	29.8	210 08.0	26.8	178 18.0	115	21 32.1	+ 17
9	99 43.8	0 33.7	·· 03.0	103 19.5	·· 11.7	299 46.4	·· 29.6	225 10.4	·· 26.8	192 48.5	115	·21 30.4	+ 19
10	114 46.3	15 34.0	03.1	118 22.1	11.8	314 48.3	29.4	240 12.8	26.8	207 19.0	115	21 28.5	+ 19
11	129 48.8	30 34.3	03.1	133 24.7	11.9	329 50.3	29.2	255 15.2	26.9	221 49.5	116	21 26.6	+ 21
12	144 51.2	45 34.6	+19 03.2	148 27.3	− 8 12.1	344 52.3	+ 9 29.0	270 17.6	−17 26.9	236 20.1	115	−21 24.5	+ 21
13	159 53.7	60 34.9	03.3	163 29.9	12.2	359 54.2	28.8	285 20.0	26.9	250 50.6	117	21 22.4	+ 22
14	174 56.1	75 35.3	03.3	178 32.6	12.3	14 56.2	28.6	300 22.4	26.9	265 21.3	116	21 20.2	+ 24
15	189 58.6	90 35.6	·· 03.4	193 35.2	·· 12.5	29 58.1	·· 28.4	315 24.8	·· 27.0	279 51.9	117	·21 17.8	+ 24
16	205 01.1	105 35.9	03.5	208 37.8	12.6	45 00.1	28.2	330 27.2	27.0	294 22.6	117	21 15.4	+ 26
17	220 03.5	120 36.2	03.5	223 40.4	12.7	60 02.1	28.0	345 29.6	27.0	308 53.3	117	21 12.8	+ 26
18	235 06.0	135 36.5	+19 03.6	238 43.1	− 8 12.9	75 04.0	+ 9 27.8	0 32.0	−17 27.0	323 24.0	117	−21 10.2	+ 27
19	250 08.5	150 36.8	03.7	253 45.7	13.0	90 06.0	27.6	15 34.4	27.1	337 54.7	118	21 07.5	+ 28
20	265 10.9	165 37.1	03.7	268 48.3	13.2	105 08.0	27.4	30 36.8	27.1	352 25.5	118	21 04.7	+ 30
21	280 13.4	180 37.4	·· 03.8	283 50.9	·· 13.3	120 09.9	·· 27.2	45 39.2	·· 27.1	6 56.3	118	·21 01.7	+ 30
22	295 15.9	195 37.6	03.8	298 53.6	13.4	135 11.9	27.0	60 41.6	27.2	21 27.1	119	20 58.7	+ 31
23	310 18.3	210 37.9	03.9	313 56.2	13.6	150 13.9	26.8	75 44.0	27.2	35 58.0	119	20 55.6	+ 32
17 0	325 20.8	225 38.2	+19 04.0	328 58.8	− 8 13.7	165 15.8	+ 9 26.6	90 46.4	−17 27.2	50 28.9	119	−20 52.4	+ 33
1	340 23.2	240 38.5	04.0	344 01.5	13.9	180 17.8	26.4	105 48.8	27.2	64 59.8	120	20 49.1	+ 34
2	355 25.7	255 38.8	04.1	359 04.1	14.0	195 19.7	26.2	120 51.2	27.3	79 30.8	120	20 45.7	+ 35
3	10 28.2	270 39.1	·· 04.1	14 06.7	·· 14.1	210 21.7	·· 26.0	135 53.5	·· 27.3	94 01.8	120	·20 42.2	+ 36
4	25 30.6	285 39.4	04.2	29 09.4	14.3	225 23.7	25.8	150 55.9	27.3	108 32.8	120	20 38.6	+ 37
5	40 33.1	300 39.7	04.3	44 12.0	14.4	240 25.6	25.6	165 58.3	27.3	123 03.8	121	20 34.9	+ 38
6	55 35.6	315 40.0	+19 04.3	59 14.7	− 8 14.6	255 27.6	+ 9 25.4	181 00.7	−17 27.4	137 34.9	121	−20 31.1	+ 39
7	70 38.0	330 40.2	04.4	74 17.3	14.7	270 29.6	25.2	196 03.1	27.4	152 06.0	122	20 27.2	+ 39
8	85 40.5	345 40.5	04.4	89 20.0	14.8	285 31.5	25.0	211 05.5	27.4	166 37.2	122	20 23.3	+ 41
9	100 43.0	0 40.8	·· 04.5	104 22.6	·· 15.0	300 33.5	·· 24.8	226 07.9	·· 27.4	181 08.4	122	·20 19.2	+ 42
10	115 45.4	15 41.1	04.5	119 25.2	15.1	315 35.4	24.6	241 10.3	27.5	195 39.6	122	20 15.0	+ 42
11	130 47.9	30 41.4	04.6	134 27.9	15.3	330 37.4	24.4	256 12.7	27.5	210 10.8	123	20 10.8	+ 43
12	145 50.4	45 41.6	+19 04.6	149 30.5	− 8 15.4	345 39.4	+ 9 24.2	271 15.1	−17 27.5	224 42.1	123	−20 06.5	+ 44
13	160 52.8	60 41.9	04.7	164 33.2	15.6	0 41.3	24.0	286 17.5	27.5	239 13.4	123	20 02.1	+ 46
14	175 55.3	75 42.2	04.7	179 35.8	15.7	15 43.3	23.8	301 19.9	27.6	253 44.7	124	19 57.5	+ 46
15	190 57.7	90 42.4	·· 04.8	194 38.5	·· 15.9	30 45.3	·· 23.6	316 22.3	·· 27.6	268 16.1	124	·19 52.9	+ 47
16	206 00.2	105 42.7	04.9	209 41.2	16.0	45 47.2	23.4	331 24.7	27.6	282 47.5	125	19 48.2	+ 47
17	221 02.7	120 43.0	04.9	224 43.8	16.1	60 49.2	23.2	346 27.1	27.6	297 19.0	124	19 43.5	+ 49
18	236 05.1	135 43.3	+19 05.0	239 46.5	− 8 16.3	75 51.1	+ 9 23.0	1 29.5	−17 27.7	311 50.4	126	−19 38.6	+ 50
19	251 07.6	150 43.5	05.0	254 49.1	16.4	90 53.1	22.8	16 31.9	27.7	326 22.0	125	19 33.6	+ 50
20	266 10.1	165 43.8	05.1	269 51.8	16.6	105 55.1	22.6	31 34.2	27.7	340 53.5	126	19 28.6	+ 51
21	281 12.5	180 44.0	·· 05.1	284 54.5	·· 16.7	120 57.0	·· 22.4	46 36.6	·· 27.8	355 25.1	126	·19 23.5	+ 52
22	296 15.0	195 44.3	05.2	299 57.1	16.9	135 59.0	22.2	61 39.0	27.8	9 56.7	127	19 18.3	+ 53
23	311 17.5	210 44.6	05.2	314 59.8	17.0	151 01.0	22.0	76 41.4	27.8	24 28.4	126	19 13.0	+ 54
18 0	326 19.9	225 44.8	+19 05.2	330 02.4	− 8 17.2	166 02.9	+ 9 21.8	91 43.8	−17 27.8	39 00.0	128	−19 07.6	+ 55
1	341 22.4	240 45.1	05.3	345 05.1	17.3	181 04.9	21.6	106 46.2	27.9	53 31.8	127	19 02.1	+ 55
2	356 24.9	255 45.3	05.3	0 07.8	17.5	196 06.8	21.4	121 48.6	27.9	68 03.5	128	18 56.6	+ 57
3	11 27.3	270 45.6	·· 05.4	15 10.4	·· 17.6	211 08.8	·· 21.2	136 51.0	·· 27.9	82 35.3	128	·18 50.9	+ 57
4	26 29.8	285 45.9	05.4	30 13.1	17.8	226 10.8	21.0	151 53.4	27.9	97 07.1	129	18 45.2	+ 58
5	41 32.2	300 46.1	05.5	45 15.8	17.9	241 12.7	20.8	166 55.8	28.0	111 39.0	129	18 39.4	+ 59
6	56 34.7	315 46.4	+19 05.5	60 18.5	− 8 18.1	256 14.7	+ 9 20.6	181 58.2	−17 28.0	126 10.9	129	−18 33.5	+ 60
7	71 37.2	330 46.6	05.6	75 21.1	18.2	271 16.6	20.4	197 00.5	28.0	140 42.8	130	18 27.5	+ 60
8	86 39.6	345 46.9	05.6	90 23.8	18.4	286 18.6	20.2	212 02.9	28.1	155 14.8	130	18 21.5	+ 61
9	101 42.1	0 47.1	·· 05.7	105 26.5	·· 18.5	301 20.6	·· 20.0	227 05.3	·· 28.1	169 46.8	130	·18 15.4	+ 62
10	116 44.6	15 47.3	05.7	120 29.2	18.7	316 22.5	19.8	242 07.7	28.1	184 18.8	131	18 09.2	+ 63
11	131 47.0	30 47.6	05.7	135 31.8	18.8	331 24.5	19.6	257 10.1	28.1	198 50.9	131	18 02.9	+ 64
12	146 49.5	45 47.8	+19 05.8	150 34.5	− 8 19.0	346 26.5	+ 9 19.4	272 12.5	−17 28.2	213 23.0	131	−17 56.5	+ 65
13	161 52.0	60 48.1	05.8	165 37.2	19.1	1 28.4	19.2	287 14.9	28.2	227 55.1	132	17 50.0	+ 65
14	176 54.4	75 48.3	05.9	180 39.9	19.3	16 30.4	19.0	302 17.3	28.2	242 27.3	132	17 43.5	+ 66
15	191 56.9	90 48.6	·· 05.9	195 42.6	·· 19.4	31 32.3	·· 18.8	317 19.7	·· 28.2	256 59.5	133	·17 36.9	+ 67
16	206 59.3	105 48.8	06.0	210 45.3	19.6	46 34.3	18.6	332 22.1	28.3	271 31.8	132	17 30.2	+ 67
17	222 01.8	120 49.0	06.0	225 48.0	19.7	61 36.3	18.4	347 24.4	28.3	286 04.0	133	17 23.5	+ 68
18	237 04.3	135 49.3	+19 06.0	240 50.6	− 8 19.9	76 38.2	+ 9 18.2	2 26.8	−17 28.3	300 36.3	134	−17 16.7	+ 69
19	252 06.7	150 49.5	06.1	255 53.3	20.1	91 40.2	18.0	17 29.2	28.4	315 08.7	134	17 09.8	+ 70
20	267 09.2	165 49.7	06.1	270 56.0	20.2	106 42.2	17.8	32 31.6	28.4	329 41.1	134	17 02.8	+ 71
21	282 11.7	180 50.0	·· 06.1	285 58.7	·· 20.4	121 44.1	·· 17.6	47 34.0	·· 28.4	344 13.5	135	·16 55.7	+ 71
22	297 14.1	195 50.2	06.2	301 01.4	20.5	136 46.1	17.4	62 36.4	28.4	358 46.0	134	16 48.6	+ 72
23	312 16.6	210 50.4	06.2	316 04.1	20.7	151 48.0	17.2	77 38.8	28.5	13 18.4	136	16 41.4	+ 73
24	327 19.1	225 50.7	+19 06.3	331 06.8	− 8 20.8	166 50.0	+ 9 17.0	92 41.2	−17 28.5	27 51.0	135	−16 34.1	+ 73
code	−	+ 3	+ 1	+ 27	− 2	+ 19	− 2	+ 24	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
16 0	178 55.8	+13 49.4
1	193 55.9	48.6
2	208 56.0	47.8
3	223 56.1	·· 47.0
4	238 56.3	46.2
5	253 56.4	45.4
6	268 56.5	+13 44.6
7	283 56.7	43.8
8	298 56.8	43.1
9	313 56.9	·· 42.3
10	328 57.0	41.5
11	343 57.2	40.7
12	358 57.3	+13 39.9
13	13 57.4	39.1
14	28 57.6	38.3
15	43 57.7	·· 37.5
16	58 57.8	36.7
17	73 57.9	35.9
18	88 58.1	+13 35.1
19	103 58.2	34.3
20	118 58.3	33.5
21	133 58.5	·· 32.7
22	148 58.6	32.0
23	163 58.7	31.2
17 0	178 58.9	+13 30.4
1	193 59.0	29.6
2	208 59.1	28.8
3	223 59.3	·· 28.0
4	238 59.4	27.2
5	253 59.5	26.4
6	268 59.7	+13 25.6
7	283 59.8	24.8
8	298 59.9	24.0
9	314 00.1	·· 23.2
10	329 00.2	22.4
11	344 00.3	21.6
12	359 00.5	+13 20.8
13	14 00.6	20.0
14	29 00.7	19.2
15	44 00.9	·· 18.4
16	59 01.0	17.6
17	74 01.1	16.8
18	89 01.3	+13 16.0
19	104 01.4	15.2
20	119 01.5	14.4
21	134 01.7	·· 13.6
22	149 01.8	12.8
23	164 02.0	12.0
18 0	179 02.1	+13 11.2
1	194 02.2	10.3
2	209 02.4	09.5
3	224 02.5	·· 08.7
4	239 02.6	07.9
5	254 02.8	07.1
6	269 02.9	+13 06.3
7	284 03.1	05.5
8	299 03.2	04.7
9	314 03.3	·· 03.9
10	329 03.5	03.1
11	344 03.6	02.3
12	359 03.8	+13 01.5
13	14 03.9	13 00.7
14	29 04.0	12 59.8
15	44 04.2	·· 59.0
16	59 04.3	58.2
17	74 04.5	57.4
18	89 04.6	+12 56.6
19	104 04.7	55.8
20	119 04.9	55.0
21	134 05.0	·· 54.2
22	149 05.2	53.4
23	164 05.3	52.5
24	179 05.4	+12 51.7
code	—	− 8

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 50.6	−40 28.3
5	Achernar	335 58.1	−57 27.0
30	Acrux	173 57.5	−62 51.8
19	Adhara	255 46.3	−28 54.6
10	Aldebaran	291 38.4	+16 25.4
32	Alioth	166 58.4	+56 11.9
34	Alkaid	153 32.6	+49 32.0
55	Al Na'ir	28 36.6	−47 10.1
15	Alnilam	276 29.8	− 1 13.6
25	Alphard	218 38.2	− 8 28.2
41	Alphecca	126 47.1	+26 51.8
1	Alpheratz	358 27.3	+28 51.2
51	Altair	62 49.5	+ 8 45.4
2	Ankaa	353 57.3	−42 32.1
42	Antares	113 18.4	−26 20.3
37	Arcturus	146 34.7	+19 24.6
43	Atria	108 58.3	−68 57.3
22	Avior	234 36.1	−59 22.1
13	Bellatrix	279 17.8	+ 6 18.8
16	Betelg'se	271 47.6	+ 7 24.1
17	Canopus	264 15.4	−52 40.1
12	Capella	281 37.6	+45 57.2
53	Deneb	50 00.1	+45 07.7
28	Denebola	183 17.3	+14 48.9
4	Diphda	349 38.3	−18 13.2
27	Dubhe	194 44.4	+61 59.2
14	Elnath	279 06.6	+28 34.3
47	Eltanin	91 05.6	+51 29.9
54	Enif	34 28.6	+ 9 40.8
56	Fomalhaut	16 10.5	−29 50.9
31	Gacrux	172 48.8	−56 52.5
29	Gienah	176 36.4	−17 18.1
35	Hadar	149 48.6	−60 10.2
6	Hamal	328 48.7	+23 15.5
48	Kaus Aust.	84 40.0	−34 24.4
40	Kochab	137 18.3	+74 20.3
57	Markab	14 20.4	+14 58.5
8	Menkar	314 59.6	+ 3 55.4
36	Menkent	148 58.0	−36 09.6
24	Miapl'dus	221 49.7	−69 32.4
9	Mirfak	309 41.4	+49 42.4
50	Nunki	76 50.8	−26 21.1
52	Peacock	54 25.7	−56 52.5
21	Pollux	244 20.1	+28 07.9
20	Procyon	245 44.6	+ 5 20.2
46	R'alhague	96 45.8	+12 35.6
26	Regulus	208 29.1	+12 10.8
11	Rigel	281 53.1	− 8 14.9
38	Rigil Kent.	140 50.2	−60 39.7
44	Sabik	103 01.3	−15 40.3
3	Schedar	350 28.8	+56 18.0
45	Shaula	97 19.5	−37 04.5
18	Sirius	259 11.5	−16 39.2
33	Spica	159 16.3	−10 56.2
23	Suhail	223 24.2	−43 15.4
49	Vega	81 07.5	+38 44.8
39	Zub'g'bi	137 52.7	−15 51.8

GMT	Equation of Time (App.—Mean) 16	17	18
h	m s	m s	m s
0	− 4 17.2	− 4 04.8	− 3 51.9
6	− 4 14.2	− 4 01.6	− 3 48.6
12	− 4 11.1	− 3 58.4	− 3 45.3
18	− 4 08.0	− 3 55.2	− 3 41.9
24	− 4 04.8	− 3 51.9	− 3 38.5

Lat. N	Sunrise	Twlt. begins	Moonrise 16	17	18	19
°	h m	h m	h m	h m	h m	h m
72	2 37	////	▬	▬	20 45	20 05
70	3 06	////	▬	▬	20 25	19 53
68	3 27	////	////	19 23	19 20	19 17
66	3 44	////	19 24	18 48	18 56	19 01
64	3 58	////	18 31	18 22	18 38	18 47
62	4 09	////	17 58	18 03	18 22	18 36
60	4 19	////	17 34	17 46	18 09	18 26
58	4 27	0 44	17 15	17 32	17 58	18 18
56	4 35	1 33	16 59	17 20	17 48	18 10
54	4 41	2 00	16 46	17 10	17 39	18 03
52	4 47	2 21	16 34	17 01	17 32	17 57
50	4 52	2 38	16 23	16 52	17 25	17 52
45	5 04	3 09	16 14	16 35	17 10	17 40
40	5 13	3 31	15 55	16 20	16 57	17 30
35	5 21	3 49	15 39	16 08	16 47	17 22
30	5 28	4 02	15 25	15 57	16 37	17 14
20	5 40	4 23	15 13	15 39	16 21	17 01
10	5 51	4 39	14 53	15 23	16 07	16 50
0	6 01	4 50	14 36	15 08	15 54	16 39
10	6 10	5 00	14 20	14 52	15 41	16 29
20	6 20	5 06	14 03	14 36	15 27	16 17
30	6 32	5 12	13 46	14 18	15 11	16 04
35	6 38	5 14	13 26	14 07	15 01	15 56
40	6 46	5 16	13 14	13 54	14 50	15 48
45	6 54	5 17	13 01	13 40	14 38	15 38
50	7 04	5 17	12 45	13 22	14 22	15 25
52	7 09	5 17	12 25	13 13	14 15	15 19
54	7 14	5 17	12 16	13 13	14 15	15 19
56	7 20	5 17	12 05	13 04	14 07	15 13
58	7 27	5 15	11 53	12 53	13 58	15 06
60	7 34	5 15	11 39	12 40	13 47	14 58
S			11 23	12 26	13 36	14 49

Lat. N	Sunset	Twlt. ends	Moonset 16	17	18	19
°	h m	h m	h m	h m	h m	h m
72	21 25	////	▬	▬	23 38	25 51
70	20 58	////	▬	22 21	24 29	0 29
68	20 37	////	21 43	23 23	25 01	1 01
66	20 21	////	22 36	23 58	25 24	1 24
64	20 08	////	23 09	24 23	0 23	1 43
62	19 57	////	23 32	24 42	0 42	1 57
60	19 47	////	23 51	24 58	0 58	2 10
58	19 39	23 11	24 07	0 07	1 11	2 21
56	19 32	22 29	24 20	0 20	1 23	2 30
54	19 26	22 03	24 32	0 32	1 33	2 38
52	19 20	21 43	24 42	0 42	1 42	2 45
50	19 15	21 27	24 51	0 51	1 50	2 52
45	19 03	20 56	0 17	1 10	2 07	3 06
40	18 54	20 35	0 33	1 26	2 21	3 18
35	18 46	20 18	0 47	1 39	2 33	3 28
30	18 39	20 04	0 59	1 51	2 43	3 36
20	18 27	19 44	1 20	2 10	3 01	3 51
10	18 17	19 29	1 38	2 27	3 16	4 04
0	18 07	19 18	1 54	2 43	3 30	4 16
10	17 58	19 09	2 11	2 59	3 44	4 28
20	17 48	19 02	2 29	3 16	3 59	4 41
30	17 37	18 58	2 49	3 35	4 17	4 55
35	17 30	18 55	3 01	3 46	4 27	5 03
40	17 23	18 54	3 15	3 59	4 38	5 13
45	17 15	18 54	3 31	4 14	4 52	5 24
50	17 04	18 53	3 51	4 33	5 08	5 37
52	17 00	18 54	4 00	4 41	5 15	5 44
54	16 54	18 54	4 11	4 51	5 24	5 50
56	16 49	18 55	4 23	5 02	5 33	5 58
58	16 42	18 55	4 37	5 15	5 44	6 07
60	16 35	18 57	4 53	5 30	5 56	6 16

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
16	20 31	8 58	2 08	13 00	17 58
17	21 19	8 57	2 04	12 57	17 54
18	22 05	8 57	2 00	12 54	17 50
19	22 50	8 57	1 55	12 51	17 46

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.1	0.2	0.3
30	0.1	0.2	0.3
45	0.1	0.2	0.2
60	0.1	0.1	0.1
75	0.1	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	16	17	18
°	′	′	′
0	12.1	11.9	11.7
4	12.1	11.9	11.7
8	12.2	11.9	11.8
12	12.2	11.9	11.8
16	12.2	12.0	11.9
20	12.3	12.1	12.0
24	12.4	12.2	12.0
28	12.5	12.2	12.1
32	12.6	12.4	12.2
36	12.7	12.5	12.4
40	12.8	12.6	12.5
44	12.9	12.7	12.6
48	13.1	12.9	12.8
52	13.2	13.1	13.0
56	13.4	13.2	13.1
60	13.5	13.4	13.3
64	13.7	13.6	13.5
68	13.9	13.8	13.7
72	14.1	14.0	13.9
76	14.3	14.2	14.1
80	14.4	14.4	14.3
84	14.6	14.6	14.5
88	14.8	14.7	14.7
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	16	17	18
°	′	′	′
0	17.5	17.7	17.7
4	17.5	17.6	17.7
8	17.5	17.6	17.7
12	17.4	17.6	17.6
16	17.4	17.5	17.6
20	17.3	17.5	17.5
24	17.2	17.4	17.4
28	17.2	17.3	17.3
32	17.1	17.2	17.2
36	16.9	17.0	17.1
40	16.8	16.9	17.0
44	16.7	16.8	16.8
48	16.6	16.6	16.7
52	16.4	16.5	16.5
56	16.2	16.3	16.3
60	16.1	16.1	16.1
64	15.9	15.9	16.0
68	15.7	15.8	15.8
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.2
84	15.0	15.0	14.9
88	14.9	14.8	14.8
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −4.1 GHA	VENUS −4.1 Dec.	MARS −2.3 GHA	MARS −2.3 Dec.	JUPITER −1.2 GHA	JUPITER −1.2 Dec.	SATURN 0.7 GHA	SATURN 0.7 Dec	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
19 0	327 19.1	225 50.7	+19 06.3	331 06.8	− 8 20.8	166 50.0	+ 9 17.0	92 41.2	−17 28.5	27 51.0	135	−16 34.1	+ 73
1	342 21.5	240 50.9	06.3	346 09.5	21.0	181 52.0	16.8	107 43.6	28.5	42 23.5	136	16 26.8	+ 74
2	357 24.0	255 51.1	06.3	1 12.2	21.1	196 53.9	16.6	122 45.9	28.5	56 56.1	136	16 19.4	+ 75
3	12 26.5	270 51.3	·· 06.4	16 14.9	·· 21.3	211 55.9	·· 16.4	137 48.3	·· 28.6	71 28.7	137	·16 11.9	+ 76
4	27 28.9	285 51.5	06.4	31 17.6	21.5	226 57.8	16.2	152 50.7	28.6	86 01.4	137	16 04.3	+ 76
5	42 31.4	300 51.8	06.4	46 20.3	21.6	241 59.8	16.0	167 53.1	28.6	100 34.1	137	15 56.7	+ 77
6	57 33.8	315 52.0	+19 06.5	61 23.0	− 8 21.8	257 01.8	+ 9 15.8	182 55.5	−17 28.7	115 06.8	138	−15 49.0	+ 78
7	72 36.3	330 52.2	06.5	76 25.7	21.9	272 03.7	15.6	197 57.9	28.7	129 39.6	137	15 41.2	+ 78
8	87 38.8	345 52.4	06.5	91 28.4	22.1	287 05.7	15.4	213 00.3	28.7	144 12.3	139	15 33.4	+ 79
9	102 41.2	0 52.6	·· 06.6	106 31.1	·· 22.2	302 07.7	·· 15.2	228 02.6	·· 28.7	158 45.2	138	·15 25.5	+ 79
10	117 43.7	15 52.9	06.6	121 33.8	22.4	317 09.6	15.0	243 05.0	28.8	173 18.0	139	15 17.6	+ 81
11	132 46.2	30 53.1	06.6	136 36.6	22.6	332 11.6	14.8	258 07.4	28.8	187 50.9	139	15 09.5	+ 81
12	147 48.6	45 53.3	+19 06.6	151 39.3	− 8 22.7	347 13.5	+ 9 14.6	273 09.8	−17 28.8	202 23.8	140	−15 01.4	+ 81
13	162 51.1	60 53.5	06.7	166 42.0	22.9	2 15.5	14.4	288 12.2	28.9	216 56.8	140	14 53.3	+ 83
14	177 53.6	75 53.7	06.7	181 44.7	23.0	17 17.5	14.2	303 14.6	28.9	231 29.8	140	14 45.0	+ 82
15	192 56.0	90 53.9	·· 06.7	196 47.4	·· 23.2	32 19.4	·· 14.0	318 17.0	·· 28.9	246 02.8	140	·14 36.8	+ 84
16	207 58.5	105 54.1	06.8	211 50.1	23.4	47 21.4	13.8	333 19.3	28.9	260 35.8	141	14 28.4	+ 84
17	223 01.0	120 54.3	06.8	226 52.9	23.5	62 23.3	13.6	348 21.7	29.0	275 08.9	141	14 20.0	+ 85
18	238 03.4	135 54.5	+19 06.8	241 55.6	− 8 23.7	77 25.3	+ 9 13.4	3 24.1	−17 29.0	289 42.0	141	−14 11.5	+ 85
19	253 05.9	150 54.7	06.8	256 58.3	23.9	92 27.3	13.2	18 26.5	29.0	304 15.1	142	14 03.0	+ 86
20	268 08.3	165 54.9	06.9	272 01.0	24.0	107 29.2	13.0	33 28.9	29.1	318 48.3	142	13 54.4	+ 87
21	283 10.8	180 55.1	·· 06.9	287 03.7	·· 24.2	122 31.2	·· 12.8	48 31.3	·· 29.1	333 21.5	142	·13 45.7	+ 87
22	298 13.3	195 55.3	06.9	302 06.5	24.3	137 33.1	12.6	63 33.7	29.1	347 54.7	143	13 37.0	+ 88
23	313 15.7	210 55.5	06.9	317 09.2	24.5	152 35.1	12.4	78 36.0	29.1	2 28.0	142	13 28.2	+ 88
20 0	328 18.2	225 55.7	+19 06.9	332 11.9	− 8 24.7	167 37.1	+ 9 12.2	93 38.4	−17 29.2	17 01.2	143	−13 19.4	+ 89
1	343 20.7	240 55.9	07.0	347 14.7	24.8	182 39.0	12.0	108 40.8	29.2	31 34.5	144	13 10.5	+ 89
2	358 23.1	255 56.1	07.0	2 17.4	25.0	197 41.0	11.8	123 43.2	29.2	46 07.9	143	13 01.6	+ 90
3	13 25.6	270 56.3	·· 07.0	17 20.1	·· 25.2	212 43.0	·· 11.6	138 45.6	·· 29.3	60 41.2	144	·12 52.6	+ 91
4	28 28.1	285 56.5	07.0	32 22.9	25.3	227 44.9	11.4	153 48.0	29.3	75 14.6	144	12 43.5	+ 91
5	43 30.5	300 56.7	07.1	47 25.6	25.5	242 46.9	11.2	168 50.3	29.3	89 48.0	145	12 34.4	+ 92
6	58 33.0	315 56.9	+19 07.1	62 28.3	− 8 25.7	257 48.8	+ 9 11.0	183 52.7	−17 29.3	104 21.5	144	−12 25.2	+ 92
7	73 35.4	330 57.1	07.1	77 31.1	25.8	272 50.8	10.8	198 55.1	29.4	118 54.9	145	12 16.0	+ 92
8	88 37.9	345 57.3	07.1	92 33.8	26.0	287 52.8	10.6	213 57.5	29.4	133 28.4	146	12 06.8	+ 94
9	103 40.4	0 57.4	·· 07.1	107 36.5	·· 26.2	302 54.7	·· 10.4	228 59.9	·· 29.4	148 02.0	145	·11 57.4	+ 93
10	118 42.8	15 57.6	07.1	122 39.3	26.3	317 56.7	10.2	244 02.3	29.5	162 35.5	146	11 48.1	+ 95
11	133 45.3	30 57.8	07.2	137 42.0	26.5	332 58.6	10.0	259 04.6	29.5	177 09.1	146	11 38.6	+ 95
12	148 47.8	45 58.0	+19 07.2	152 44.8	− 8 26.7	348 00.6	+ 9 09.8	274 07.0	−17 29.5	191 42.7	146	−11 29.1	+ 95
13	163 50.2	60 58.2	07.2	167 47.5	26.8	3 02.6	09.6	289 09.4	29.5	206 16.3	146	11 19.6	+ 96
14	178 52.7	75 58.3	07.2	182 50.3	27.0	18 04.5	09.4	304 11.8	29.6	220 49.9	147	11 10.0	+ 96
15	193 55.2	90 58.5	·· 07.2	197 53.0	·· 27.2	33 06.5	·· 09.2	319 14.2	·· 29.6	235 23.6	147	·11 00.4	+ 97
16	208 57.6	105 58.7	07.2	212 55.7	27.3	48 08.4	09.0	334 16.5	29.6	249 57.3	147	10 50.7	+ 97
17	224 00.1	120 58.9	07.3	227 58.5	27.5	63 10.4	08.8	349 18.9	29.7	264 31.0	147	10 41.0	+ 97
18	239 02.6	135 59.1	+19 07.3	243 01.2	− 8 27.7	78 12.4	+ 9 08.6	4 21.3	−17 29.7	279 04.7	147	−10 31.3	+ 99
19	254 05.0	150 59.2	07.3	258 04.0	27.8	93 14.3	08.4	19 23.7	29.7	293 38.4	148	10 21.4	+ 98
20	269 07.5	165 59.4	07.3	273 06.8	28.0	108 16.3	08.2	34 26.1	29.7	308 12.2	148	10 11.6	+ 99
21	284 09.9	180 59.6	·· 07.3	288 09.5	·· 28.2	123 18.2	·· 08.0	49 28.4	·· 29.8	322 46.0	148	·10 01.7	+ 100
22	299 12.4	195 59.7	07.3	303 12.3	28.3	138 20.2	07.8	64 30.8	29.8	337 19.8	148	9 51.7	+ 100
23	314 14.9	210 59.9	07.3	318 15.0	28.5	153 22.2	07.6	79 33.2	29.8	351 53.6	148	9 41.7	+ 100
21 0	329 17.3	226 00.1	+19 07.3	333 17.8	− 8 28.7	168 24.1	+ 9 07.4	94 35.6	−17 29.9	6 27.4	149	− 9 31.7	+ 101
1	344 19.8	241 00.2	07.3	348 20.5	28.9	183 26.1	07.2	109 38.0	29.9	21 01.3	149	9 21.6	+ 101
2	359 22.3	256 00.4	07.3	3 23.3	29.0	198 28.0	07.0	124 40.3	29.9	35 35.2	149	9 11.5	+ 101
3	14 24.7	271 00.6	·· 07.4	18 26.1	·· 29.2	213 30.0	·· 06.8	139 42.7	·· 30.0	50 09.1	149	· 9 01.4	+ 102
4	29 27.2	286 00.7	07.4	33 28.8	29.4	228 32.0	06.6	154 45.1	30.0	64 43.0	149	8 51.2	+ 103
5	44 29.7	301 00.9	07.4	48 31.6	29.5	243 33.9	06.4	169 47.5	30.0	79 16.9	149	8 40.9	+ 102
6	59 32.1	316 01.1	+19 07.4	63 34.4	− 8 29.7	258 35.9	+ 9 06.2	184 49.9	−17 30.0	93 50.8	150	− 8 30.7	+ 104
7	74 34.6	331 01.2	07.4	78 37.1	29.9	273 37.8	06.0	199 52.2	30.1	108 24.8	150	8 20.3	+ 103
8	89 37.1	346 01.4	07.4	93 39.9	30.1	288 39.8	05.8	214 54.6	30.1	122 58.8	150	8 10.0	+ 104
9	104 39.5	1 01.5	·· 07.4	108 42.7	·· 30.2	303 41.8	·· 05.6	229 57.0	·· 30.1	137 32.8	149	· 7 59.6	+ 104
10	119 42.0	16 01.7	07.4	123 45.4	30.4	318 43.7	05.4	244 59.4	30.2	152 06.7	151	7 49.2	+ 105
11	134 44.4	31 01.8	07.4	138 48.2	30.6	333 45.7	05.2	260 01.8	30.2	166 40.8	150	7 38.7	+ 105
12	149 46.9	46 02.0	+19 07.4	153 51.0	− 8 30.8	348 47.7	+ 9 05.0	275 04.1	−17 30.2	181 14.8	150	− 7 28.2	+ 105
13	164 49.4	61 02.1	07.4	168 53.8	30.9	3 49.6	04.8	290 06.5	30.2	195 48.8	151	7 17.7	+ 106
14	179 51.8	76 02.3	07.4	183 56.5	31.1	18 51.6	04.6	305 08.9	30.3	210 22.9	150	7 07.1	+ 106
15	194 54.3	91 02.4	·· 07.4	198 59.3	·· 31.3	33 53.5	·· 04.4	320 11.3	·· 30.3	224 56.9	151	· 6 56.5	+ 106
16	209 56.8	106 02.6	07.4	214 02.1	31.5	48 55.5	04.2	335 13.6	30.3	239 31.0	150	6 45.9	+ 106
17	224 59.2	121 02.7	07.4	229 04.9	31.6	63 57.5	04.0	350 16.0	30.4	254 05.0	151	6 35.3	+ 107
18	240 01.7	136 02.9	+19 07.4	244 07.7	− 8 31.8	78 59.4	+ 9 03.8	5 18.4	−17 30.4	268 39.1	151	− 6 24.6	+ 108
19	255 04.2	151 03.0	07.4	259 10.4	32.0	94 01.4	03.6	20 20.8	30.4	283 13.2	151	6 13.8	+ 107
20	270 06.6	166 03.2	07.4	274 13.2	32.2	109 03.3	03.4	35 23.1	30.5	297 47.3	151	6 03.1	+ 108
21	285 09.1	181 03.3	·· 07.4	289 16.0	·· 32.3	124 05.3	·· 03.2	50 25.5	·· 30.5	312 21.4	151	· 5 52.3	+ 108
22	300 11.5	196 03.5	07.4	304 18.8	32.5	139 07.3	03.0	65 27.9	30.5	326 55.5	151	5 41.5	+ 108
23	315 14.0	211 03.6	07.4	319 21.6	32.7	154 09.2	02.8	80 30.3	30.5	341 29.6	151	5 30.7	+ 109
24	330 16.5	226 03.7	+19 07.4	334 24.4	− 8 32.9	169 11.2	+ 9 02.6	95 32.7	−17 30.6	356 03.7	152	− 5 19.8	+ 109
code		+ 2	0	+ 27	− 1	+ 20	− 2	+ 24	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
19 00	179 05.4	+12 51.7	7	Acamar	315 50.5	−40 28.3
01	194 05.6	50.9	5	Achernar	335 58.1	−57 27.0
02	209 05.7	50.1	30	Acrux	173 57.5	−62 51.8
03	224 05.9	·· 49.3	19	Adhara	255 46.3	−28 54.6
04	239 06.0	48.5	10	Aldebaran	291 38.3	+16 25.4
05	254 06.2	47.7				
06	269 06.3	+12 46.8	32	Alioth	166 58.4	+56 11.9
07	284 06.4	46.0	34	Alkaid	153 32.6	+49 32.0
08	299 06.6	45.2	55	Al Na'ir	28 36.6	−47 10.1
09	314 06.7	·· 44.4	15	Alnilam	276 29.7	− 1 13.6
10	329 06.9	43.6	25	Alphard	218 38.2	− 8 28.2
11	344 07.0	42.8				
12	359 07.2	+12 41.9	41	Alphecca	126 47.1	+26 51.8
13	14 07.3	41.1	1	Alpheratz	358 27.3	+28 51.2
14	29 07.5	40.3	51	Altair	62 49.5	+ 8 45.4
15	44 07.6	·· 39.5	2	Ankaa	353 57.3	−42 32.1
16	59 07.8	38.7	42	Antares	113 18.4	−26 20.3
17	74 07.9	37.8				
18	89 08.0	+12 37.0	37	Arcturus	146 34.7	+19 24.6
19	104 08.2	36.2	43	Atria	108 58.4	−68 57.3
20	119 08.3	35.4	22	Avior	234 36.1	−59 22.1
21	134 08.5	·· 34.6	13	Bellatrix	279 17.8	+ 6 18.8
22	149 08.6	33.7	16	Betelg'se	271 47.6	+ 7 24.1
23	164 08.8	32.9				
			17	Canopus	264 15.4	−52 40.1
20 00	179 08.9	+12 32.1	12	Capella	281 37.6	+45 57.2
01	194 09.1	31.3	53	Deneb	50 00.1	+45 07.7
02	209 09.2	30.5	28	Denebola	183 17.3	+14 48.9
03	224 09.4	·· 29.6	4	Diphda	349 38.3	−18 13.2
04	239 09.5	28.8				
05	254 09.7	28.0	27	Dubhe	194 44.4	+61 59.2
06	269 09.8	+12 27.2	14	Elnath	279 06.6	+28 34.3
07	284 10.0	26.3	47	Eltanin	91 05.6	+51 29.9
08	299 10.1	25.5	54	Enif	34 28.6	+ 9 40.8
09	314 10.3	·· 24.7	56	Fomalhaut	16 10.5	−29 50.9
10	329 10.4	23.9				
11	344 10.6	23.0	31	Gacrux	172 48.9	−56 52.4
12	359 10.7	+12 22.2	29	Gienah	176 36.4	−17 18.1
13	14 10.9	21.4	35	Hadar	149 48.7	−60 10.1
14	29 11.0	20.6	6	Hamal	328 48.7	+23 15.5
15	44 11.2	·· 19.7	48	Kaus Aust.	84 40.0	−34 24.4
16	59 11.3	18.9				
17	74 11.5	18.1	40	Kochab	137 18.3	+74 20.3
18	89 11.6	+12 17.3	57	Markab	14 20.4	+14 58.5
19	104 11.8	16.4	8	Menkar	314 59.5	+ 3 55.4
20	119 11.9	15.6	36	Menkent	148 58.0	−36 09.6
21	134 12.1	·· 14.8	24	Miapl'dus	221 49.7	−69 32.3
22	149 12.2	13.9				
23	164 12.4	13.1	9	Mirfak	309 41.3	+49 42.4
			50	Nunki	76 50.8	−26 21.1
21 00	179 12.5	+12 12.3	52	Peacock	54 25.7	−56 52.5
01	194 12.7	11.4	21	Pollux	244 20.1	+28 07.9
02	209 12.8	10.6	20	Procyon	245 44.5	+ 5 20.2
03	224 13.0	·· 09.8				
04	239 13.1	09.0	46	R'alhague	96 45.8	+12 35.6
05	254 13.3	08.1	26	Regulus	208 29.1	+12 10.8
06	269 13.4	+12 07.3	11	Rigel	281 53.1	− 8 14.9
07	284 13.6	06.5	38	Rigil Kent.	140 50.2	−60 39.7
08	299 13.8	05.6	44	Sabik	103 01.3	−15 40.3
09	314 13.9	·· 04.8				
10	329 14.1	04.0	3	Schedar	350 28.7	+56 18.0
11	344 14.2	03.1	45	Shaula	97 19.6	−37 04.5
12	359 14.4	+12 02.3	18	Sirius	259 11.5	−16 39.2
13	14 14.5	01.5	33	Spica	159 16.3	−10 56.2
14	29 14.7	12 00.6	23	Suhail	223 24.2	−43 15.4
15	44 14.8	·11 59.8				
16	59 15.0	59.0	49	Vega	81 07.5	+38 44.9
17	74 15.1	58.1	39	Zub'g'bi	137 52.7	−15 51.8
18	89 15.3	+11 57.3				
19	104 15.5	56.5				
20	119 15.6	55.6				
21	134 15.8	·· 54.8				
22	149 15.9	53.9				
23	164 16.1	53.1				
24	179 16.2	+11 52.3				
code	—	− 8				

GMT	Equation of Time (App.—Mean) 19	20	21
h	m s	m s	m s
0	− 3 38.5	− 3 24.6	− 3 10.2
6	− 3 35.1	− 3 21.0	− 3 06.5
12	− 3 31.6	− 3 17.5	− 3 02.8
18	− 3 28.1	− 3 13.8	− 2 59.1
24	− 3 24.6	− 3 10.2	− 2 55.3

Lat. N°	Sunrise h m	Twlt. begins h m	Moonrise 19 h m	20 h m	21 h m	22 h m
72	2 56	////	20 05	19 43	19 27	19 12
70	3 21	////	19 38	19 27	19 18	19 10
68	3 40	////	19 17	19 14	19 11	19 08
66	3 55	////	19 01	19 03	19 05	19 06
64	4 07	////	18 47	18 54	19 00	19 04
62	4 17	////	18 36	18 47	18 55	19 03
60	4 26	////	18 26	18 40	18 51	19 02
58	4 34	1 13	18 18	18 34	18 48	19 01
56	4 40	1 48	18 10	18 29	18 45	19 00
54	4 46	2 12	18 03	18 24	18 42	18 59
52	4 52	2 30	17 57	18 20	18 40	18 58
50	4 57	2 45	17 52	18 16	18 37	18 58
45	5 07	3 14	17 40	18 07	18 32	18 56
40	5 16	3 35	17 30	18 00	18 28	18 55
35	5 24	3 52	17 22	17 54	18 24	18 54
30	5 30	4 04	17 14	17 49	18 21	18 53
20	5 41	4 24	17 01	17 39	18 16	18 51
10	5 51	4 39	16 50	17 31	18 11	18 50
0	6 00	4 50	16 39	17 23	18 06	18 49
10	6 09	4 58	16 29	17 15	18 01	18 47
20	6 18	5 05	16 17	17 07	17 56	18 46
30	6 29	5 10	16 04	16 57	17 51	18 44
35	6 35	5 11	15 56	16 52	17 47	18 43
40	6 41	5 12	15 48	16 45	17 44	18 42
45	6 49	5 12	15 38	16 38	17 39	18 41
50	6 59	5 12	15 25	16 29	17 34	18 40
52	7 03	5 11	15 19	16 25	17 32	18 39
54	7 08	5 11	15 13	16 21	17 29	18 38
56	7 13	5 09	15 06	16 16	17 26	18 37
58	7 19	5 08	14 58	16 10	17 23	18 36
60	7 25	5 07	14 49	16 04	17 19	18 35
S						

Lat. N°	Sunset h m	Twlt. ends h m	Moonset 19 h m	20 h m	21 h m	22 h m
72	21 06	////	25 51	1 51	3 44	5 30
70	20 42	////	0 29	2 17	3 58	5 36
68	20 24	////	1 01	2 37	4 10	5 42
66	20 10	////	1 24	2 52	4 19	5 46
64	19 58	////	1 43	3 05	4 27	5 50
62	19 48	////	1 57	3 15	4 34	5 53
60	19 39	////	2 10	3 24	4 40	5 56
58	19 31	22 45	2 21	3 32	4 45	5 58
56	19 25	22 13	2 30	3 39	4 49	6 00
54	19 19	21 50	2 38	3 45	4 53	6 02
52	19 14	21 33	2 45	3 51	4 57	6 04
50	19 09	21 18	2 52	3 56	5 00	6 06
45	18 58	20 49	3 06	4 07	5 08	6 09
40	18 50	20 29	3 18	4 15	5 14	6 12
35	18 42	20 13	3 28	4 23	5 19	6 14
30	18 36	20 01	3 36	4 30	5 23	6 16
20	18 25	19 41	3 51	4 41	5 31	6 20
10	18 15	19 27	4 04	4 51	5 38	6 23
0	18 07	19 17	4 16	5 00	5 44	6 26
10	17 58	19 09	4 28	5 10	5 50	6 30
20	17 49	19 03	4 41	5 20	5 57	6 33
30	17 39	18 59	4 55	5 31	6 04	6 36
35	17 33	18 58	5 03	5 37	6 08	6 38
40	17 26	18 57	5 13	5 44	6 13	6 41
45	17 18	18 57	5 24	5 53	6 19	6 43
50	17 09	18 58	5 37	6 03	6 26	6 46
52	17 05	18 59	5 44	6 08	6 29	6 48
54	17 00	18 59	5 50	6 13	6 32	6 49
56	16 55	19 00	5 58	6 18	6 36	6 51
58	16 49	19 01	6 07	6 25	6 40	6 53
60	16 42	19 03	6 16	6 32	6 44	6 55
S						

GMT of Transit
Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
19	22 50	8 57	1 55	12 51	17 46
20	23 33	8 56	1 51	12 48	17 43
21	24 16	8 56	1 47	12 45	17 39
22	0 16	8 56	1 42	12 42	17 35

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.1	0.2	0.4
30	0.1	0.2	0.3
45	0.1	0.1	0.2
60	0.1	0.1	0.1
75	0.1	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	19	20	21
°	′	′	′
0	11.9	12.0	12.2
4	11.9	12.0	12.3
8	11.9	12.0	12.3
12	11.9	12.1	12.3
16	12.0	12.1	12.4
20	12.1	12.2	12.4
24	12.2	12.3	12.5
28	12.2	12.4	12.6
32	12.4	12.5	12.7
36	12.5	12.6	12.8
40	12.6	12.7	12.9
44	12.7	12.8	13.0
48	12.9	13.0	13.2
52	13.1	13.1	13.3
56	13.2	13.3	13.5
60	13.4	13.5	13.6
64	13.6	13.6	13.8
68	13.8	13.8	14.0
72	14.0	14.0	14.1
76	14.2	14.2	14.3
80	14.4	14.4	14.5
84	14.6	14.6	14.7
88	14.7	14.7	14.8
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	19	20	21
°	′	′	′
0	17.7	17.6	17.4
4	17.6	17.6	17.4
8	17.6	17.5	17.4
12	17.6	17.5	17.4
16	17.5	17.5	17.3
20	17.5	17.4	17.3
24	17.4	17.3	17.2
28	17.3	17.2	17.1
32	17.2	17.1	17.0
36	17.0	17.0	16.9
40	16.9	16.9	16.8
44	16.8	16.7	16.6
48	16.6	16.6	16.5
52	16.5	16.4	16.4
56	16.3	16.3	16.2
60	16.1	16.1	16.1
64	15.9	15.9	15.9
68	15.8	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.2
84	15.0	15.0	15.0
88	14.8	14.8	14.9
90			

Subtract from table, back cover

Full Moon 21

GMT	♈ GHA	VENUS −4.0 GHA	Dec.	MARS −2.4 GHA	Dec.	JUPITER −1.2 GHA	Dec.	SATURN 0.7 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
22 00	330 16.5	226 03.7	+19 07.4	334 24.4	− 8 32.9	169 11.2	+ 9 02.6	95 32.7	−17 30.6	356 03.7	152	− 5 19.8	+109
01	345 18.9	241 03.9	07.4	349 27.2	33.0	184 13.1	02.4	110 35.0	30.6	10 37.9	151	5 08.9	+109
02	0 21.4	256 04.0	07.4	4 30.0	33.2	199 15.1	02.2	125 37.4	30.6	25 12.0	151	4 58.0	+109
03	15 23.9	271 04.2	·· 07.4	19 32.7	·· 33.4	214 17.1	·· 02.0	140 39.8	·· 30.7	39 46.1	151	· 4 47.1	+110
04	30 26.3	286 04.3	07.3	34 35.5	33.6	229 19.0	01.8	155 42.2	30.7	54 20.2	152	4 36.1	+109
05	45 28.8	301 04.4	07.3	49 38.3	33.8	244 21.0	01.6	170 44.5	30.7	68 54.4	151	4 25.2	+110
06	60 31.3	316 04.6	+19 07.3	64 41.1	− 8 33.9	259 22.9	+ 9 01.4	185 46.9	−17 30.8	83 28.5	151	− 4 14.2	+111
07	75 33.7	331 04.7	07.3	79 43.9	34.1	274 24.9	01.2	200 49.3	30.8	98 02.6	152	4 03.1	+110
08	90 36.2	346 04.8	07.3	94 46.7	34.3	289 26.8	01.0	215 51.7	30.8	112 36.8	151	3 52.1	+111
09	105 38.7	1 04.9	·· 07.3	109 49.5	·· 34.5	304 28.8	·· 00.8	230 54.0	·· 30.8	127 10.9	151	· 3 41.0	+111
10	120 41.1	16 05.1	07.3	124 52.3	34.7	319 30.8	00.6	245 56.4	30.9	141 45.0	152	3 29.9	+111
11	135 43.6	31 05.2	07.3	139 55.1	34.8	334 32.7	00.4	260 58.8	30.9	156 19.2	151	3 18.8	+111
12	150 46.0	46 05.3	+19 07.3	154 57.9	− 8 35.0	349 34.7	+ 9 00.2	276 01.2	−17 30.9	170 53.3	151	− 3 07.7	+111
13	165 48.5	61 05.5	07.3	170 00.7	35.2	4 36.7	9 00.0	291 03.5	31.0	185 27.4	151	2 56.6	+112
14	180 51.0	76 05.6	07.2	185 03.5	35.4	19 38.6	8 59.8	306 05.9	31.0	200 01.5	152	2 45.4	+112
15	195 53.4	91 05.7	·· 07.2	200 06.4	·· 35.6	34 40.6	·· 59.6	321 08.3	·· 31.0	214 35.7	151	· 2 34.2	+112
16	210 55.9	106 05.8	07.2	215 09.2	35.7	49 42.5	59.4	336 10.6	31.1	229 09.8	151	2 23.0	+112
17	225 58.4	121 05.9	07.2	230 12.0	35.9	64 44.5	59.2	351 13.0	31.1	243 43.9	151	2 11.8	+112
18	241 00.8	136 06.1	+19 07.2	245 14.8	− 8 36.1	79 46.4	+ 8 59.0	6 15.4	−17 31.1	258 18.0	151	− 2 00.6	+112
19	256 03.3	151 06.2	07.2	260 17.6	36.3	94 48.4	58.8	21 17.8	31.2	272 52.1	150	1 49.4	+113
20	271 05.8	166 06.3	07.1	275 20.4	36.5	109 50.4	58.6	36 20.1	31.2	287 26.1	151	1 38.1	+112
21	286 08.2	181 06.4	·· 07.1	290 23.2	·· 36.6	124 52.3	·· 58.4	51 22.5	·· 31.2	302 00.2	151	· 1 26.9	+113
22	301 10.7	196 06.5	07.1	305 26.0	36.8	139 54.3	58.2	66 24.9	31.2	316 34.3	150	1 15.6	+113
23	316 13.2	211 06.6	07.1	320 28.9	37.0	154 56.2	58.0	81 27.3	31.3	331 08.3	151	1 04.3	+113
23 00	331 15.6	226 06.7	+19 07.1	335 31.7	− 8 37.2	169 58.2	+ 8 57.8	96 29.6	−17 31.3	345 42.4	150	− 0 53.0	+113
01	346 18.1	241 06.9	07.1	350 34.5	37.4	185 00.2	57.6	111 32.0	31.3	0 16.4	150	0 41.7	+113
02	1 20.5	256 07.0	07.0	5 37.3	37.6	200 02.1	57.3	126 34.4	31.4	14 50.4	150	0 30.4	+113
03	16 23.0	271 07.1	·· 07.0	20 40.1	·· 37.7	215 04.1	·· 57.1	141 36.7	·· 31.4	29 24.4	150	· 0 19.1	+113
04	31 25.5	286 07.2	07.0	35 43.0	37.9	230 06.0	56.9	156 39.1	31.4	43 58.4	150	− 0 07.8	+113
05	46 27.9	301 07.3	07.0	50 45.8	38.1	245 08.0	56.7	171 41.5	31.5	58 32.4	149	+ 0 03.5	+114
06	61 30.4	316 07.4	+19 06.9	65 48.6	− 8 38.3	260 10.0	+ 8 56.5	186 43.9	−17 31.5	73 06.3	150	+ 0 14.9	+113
07	76 32.9	331 07.5	06.9	80 51.4	38.5	275 11.9	56.3	201 46.2	31.5	87 40.3	149	0 26.2	+113
08	91 35.3	346 07.6	06.9	95 54.3	38.7	290 13.9	56.1	216 48.6	31.6	102 14.2	149	0 37.5	+114
09	106 37.8	1 07.7	·· 06.9	110 57.1	·· 38.9	305 15.8	·· 55.9	231 51.0	·· 31.6	116 48.1	149	· 0 48.9	+113
10	121 40.3	16 07.8	06.8	125 59.9	39.0	320 17.8	55.7	246 53.3	31.6	131 22.0	149	1 00.2	+114
11	136 42.7	31 07.9	06.8	141 02.8	39.2	335 19.8	55.5	261 55.7	31.7	145 55.9	148	1 11.6	+113
12	151 45.2	46 08.0	+19 06.8	156 05.6	− 8 39.4	350 21.7	+ 8 55.3	276 58.1	−17 31.7	160 29.7	148	+ 1 22.9	+114
13	166 47.6	61 08.1	06.8	171 08.4	39.6	5 23.7	55.1	292 00.4	31.7	175 03.5	149	1 34.3	+113
14	181 50.1	76 08.2	06.7	186 11.3	39.8	20 25.6	54.9	307 02.8	31.7	189 37.4	147	1 45.6	+113
15	196 52.6	91 08.3	·· 06.7	201 14.1	·· 40.0	35 27.6	·· 54.7	322 05.2	·· 31.8	204 11.1	148	· 1 56.9	+114
16	211 55.0	106 08.4	06.7	216 16.9	40.2	50 29.6	54.5	337 07.6	31.8	218 44.9	148	2 08.3	+113
17	226 57.5	121 08.5	06.6	231 19.8	40.4	65 31.5	54.3	352 09.9	31.8	233 18.7	147	2 19.6	+114
18	242 00.0	136 08.6	+19 06.6	246 22.6	− 8 40.5	80 33.5	+ 8 54.1	7 12.3	−17 31.9	247 52.4	147	+ 2 31.0	+113
19	257 02.4	151 08.7	06.6	261 25.5	40.7	95 35.4	53.9	22 14.7	31.9	262 26.1	146	2 42.3	+113
20	272 04.9	166 08.8	06.6	276 28.3	40.9	110 37.4	53.7	37 17.0	31.9	276 59.7	147	2 53.6	+113
21	287 07.4	181 08.8	·· 06.5	291 31.1	·· 41.1	125 39.4	·· 53.5	52 19.4	·· 32.0	291 33.4	146	· 3 04.9	+114
22	302 09.8	196 08.9	06.5	306 34.0	41.3	140 41.3	53.3	67 21.8	32.0	306 07.0	146	3 16.3	+113
23	317 12.3	211 09.0	06.5	321 36.8	41.5	155 43.3	53.1	82 24.1	32.0	320 40.6	145	3 27.6	+113
24 00	332 14.8	226 09.1	+19 06.4	336 39.7	− 8 41.7	170 45.2	+ 8 52.9	97 26.5	−17 32.1	335 14.1	146	+ 3 38.9	+112
01	347 17.2	241 09.2	06.4	351 42.5	41.9	185 47.2	52.7	112 28.9	32.1	349 47.7	145	3 50.1	+113
02	2 19.7	256 09.3	06.3	6 45.4	42.0	200 49.2	52.5	127 31.2	32.1	4 21.2	144	4 01.4	+113
03	17 22.1	271 09.4	·· 06.3	21 48.2	·· 42.2	215 51.1	·· 52.3	142 33.6	·· 32.2	18 54.6	145	· 4 12.7	+112
04	32 24.6	286 09.4	06.3	36 51.1	42.4	230 53.1	52.1	157 36.0	32.2	33 28.1	144	4 23.9	+113
05	47 27.1	301 09.5	06.2	51 53.9	42.6	245 55.0	51.9	172 38.3	32.2	48 01.5	144	4 35.2	+112
06	62 29.5	316 09.6	+19 06.2	66 56.8	− 8 42.8	260 57.0	+ 8 51.7	187 40.7	−17 32.3	62 34.9	143	+ 4 46.4	+112
07	77 32.0	331 09.7	06.2	81 59.7	43.0	275 58.9	51.5	202 43.1	32.3	77 08.2	143	4 57.6	+112
08	92 34.5	346 09.8	06.1	97 02.5	43.2	291 00.9	51.3	217 45.4	32.3	91 41.5	143	5 08.8	+112
09	107 36.9	1 09.8	·· 06.1	112 05.4	·· 43.4	306 02.9	·· 51.1	232 47.8	·· 32.4	106 14.8	142	· 5 20.0	+112
10	122 39.4	16 09.9	06.0	127 08.2	43.6	321 04.8	50.9	247 50.2	32.4	120 48.0	142	5 31.2	+111
11	137 41.9	31 10.0	06.0	142 11.1	43.8	336 06.8	50.7	262 52.5	32.4	135 21.2	142	5 42.3	+112
12	152 44.3	46 10.1	+19 05.9	157 14.0	− 8 44.0	351 08.7	+ 8 50.5	277 54.9	−17 32.5	149 54.4	141	+ 5 53.5	+111
13	167 46.8	61 10.1	05.9	172 16.8	44.1	6 10.7	50.3	292 57.3	32.5	164 27.5	141	6 04.6	+111
14	182 49.3	76 10.2	05.9	187 19.7	44.3	21 12.7	50.1	307 59.6	32.5	179 00.6	141	6 15.7	+111
15	197 51.7	91 10.3	·· 05.8	202 22.5	·· 44.5	36 14.6	·· 49.9	323 02.0	·· 32.5	193 33.7	140	· 6 26.8	+110
16	212 54.2	106 10.3	05.8	217 25.4	44.7	51 16.6	49.7	338 04.4	32.6	208 06.7	139	6 37.8	+110
17	227 56.6	121 10.4	05.7	232 28.3	44.9	66 18.5	49.5	353 06.7	32.6	222 39.6	139	6 48.8	+110
18	242 59.1	136 10.5	+19 05.7	247 31.1	− 8 45.1	81 20.5	+ 8 49.3	8 09.1	−17 32.6	237 12.5	139	+ 6 59.8	+110
19	258 01.6	151 10.5	05.6	262 34.0	45.3	96 22.5	49.1	23 11.5	32.7	251 45.4	139	7 10.8	+110
20	273 04.0	166 10.6	05.6	277 36.9	45.5	111 24.4	48.9	38 13.8	32.7	266 18.3	138	7 21.8	+109
21	288 06.5	181 10.7	·· 05.5	292 39.8	·· 45.7	126 26.4	·· 48.7	53 16.2	·· 32.7	280 51.1	137	· 7 32.7	+109
22	303 09.0	196 10.7	05.5	307 42.6	45.9	141 28.3	48.5	68 18.6	32.8	295 23.8	137	7 43.6	+109
23	318 11.4	211 10.8	05.4	322 45.5	46.1	156 30.3	48.3	83 20.9	32.8	309 56.5	137	7 54.5	+108
24	333 13.9	226 10.9	+19 05.4	337 48.4	− 8 46.3	171 32.3	+ 8 48.0	98 23.3	−17 32.8	324 29.2	136	+ 8 05.3	+109
code	−	+ 1	0	+ 28	− 2	+ 20	− 2	+ 23	0				

G M T	SUN GHA	SUN Dec.
h	° ′	° ′
22 0	179 16.2	+11 52.3
1	194 16.4	51.4
2	209 16.6	50.6
3	224 16.7	49.7
4	239 16.9	48.9
5	254 17.0	48.1
6	269 17.2	+11 47.2
7	284 17.4	46.4
8	299 17.5	45.6
9	314 17.7	44.7
10	329 17.8	43.9
11	344 18.0	43.0
12	359 18.1	+11 42.2
13	14 18.3	41.3
14	29 18.5	40.5
15	44 18.6	39.7
16	59 18.8	38.8
17	74 18.9	38.0
18	89 19.1	+11 37.1
19	104 19.3	36.3
20	119 19.4	35.4
21	134 19.6	34.6
22	149 19.7	33.8
23	164 19.9	32.9
23 0	179 20.1	+11 32.1
1	194 20.2	31.2
2	209 20.4	30.4
3	224 20.6	29.5
4	239 20.7	28.7
5	254 20.9	27.8
6	269 21.0	+11 27.0
7	284 21.2	26.1
8	299 21.4	25.3
9	314 21.5	24.4
10	329 21.7	23.6
11	344 21.9	22.7
12	359 22.0	+11 21.9
13	14 22.2	21.0
14	29 22.4	20.2
15	44 22.5	19.3
16	59 22.7	18.5
17	74 22.9	17.6
18	89 23.0	+11 16.8
19	104 23.2	15.9
20	119 23.3	15.1
21	134 23.5	14.2
22	149 23.7	13.4
23	164 23.8	12.5
24 0	179 24.0	+11 11.7
1	194 24.2	10.8
2	209 24.3	10.0
3	224 24.5	09.1
4	239 24.7	08.3
5	254 24.8	07.4
6	269 25.0	+11 06.5
7	284 25.2	05.7
8	299 25.4	04.8
9	314 25.5	04.0
10	329 25.7	03.1
11	344 25.9	02.3
12	359 26.0	+11 01.4
13	14 26.2	11 00.6
14	29 26.4	10 59.7
15	44 26.5	58.8
16	59 26.7	58.0
17	74 26.9	57.1
18	89 27.0	+10 56.3
19	104 27.2	55.4
20	119 27.4	54.5
21	134 27.5	53.7
22	149 27.7	52.8
23	164 27.9	52.0
24	179 28.1	+10 51.1
code	—	− 9

No.	Name	STARS SHA	STARS Dec.
		° ′	° ′
7	Acamar	315 50.5	−40 28.3
5	Achernar	335 58.0	−57 27.0
30	Acrux	173 57.5	−62 51.8
19	Adhara	255 46.2	−28 54.6
10	Aldebaran	291 38.3	+16 25.4
32	Alioth	166 58.4	+56 11.9
34	Alkaid	153 32.6	+49 32.0
55	Al Na'ir	28 36.6	−47 10.1
15	Alnilam	276 29.7	− 1 13.6
25	Alphard	218 38.2	− 8 28.2
41	Alphecca	126 47.1	+26 51.8
1	Alpheratz	358 27.3	+28 51.2
51	Altair	62 49.5	+ 8 45.4
2	Ankaa	353 57.3	−42 32.1
42	Antares	113 18.5	−26 20.3
37	Arcturus	146 34.7	+19 24.6
43	Atria	108 58.4	−68 57.3
22	Avior	234 36.0	−59 22.1
13	Bellatrix	279 17.8	+ 6 18.8
16	Betelg'se	271 47.5	+ 7 24.1
17	Canopus	264 15.4	−52 40.1
12	Capella	281 37.6	+45 57.2
53	Deneb	50 00.1	+45 07.8
28	Denebola	183 17.3	+14 48.9
4	Diphda	349 38.3	−18 13.2
27	Dubhe	194 44.4	+61 59.1
14	Elnath	279 06.6	+28 34.3
47	Eltanin	91 05.7	+51 30.0
54	Enif	34 28.6	+ 9 40.8
56	Fomalhaut	16 10.5	−29 50.9
31	Gacrux	172 48.9	−56 52.4
29	Gienah	176 36.4	−17 18.1
35	Hadar	149 48.7	−60 10.1
6	Hamal	328 48.7	+23 15.6
48	Kaus Aust.	84 40.0	−34 24.4
40	Kochab	137 18.4	+74 20.3
57	Markab	14 20.4	+14 58.5
8	Menkar	314 59.5	+ 3 55.4
36	Menkent	148 58.0	−36 09.6
24	Miapl'dus	221 49.7	−69 32.3
9	Mirfak	309 41.3	+49 42.4
50	Nunki	76 50.8	−26 21.1
52	Peacock	54 25.7	−56 52.5
21	Pollux	244 20.0	+28 07.9
20	Procyon	245 44.5	+ 5 20.2
46	R'alhague	96 45.8	+12 35.6
26	Regulus	208 29.1	+12 10.8
11	Rigel	281 53.1	− 8 14.9
38	Rigil Kent.	140 50.2	−60 39.7
44	Sabik	103 01.3	−15 40.3
3	Schedar	350 28.7	+56 18.0
45	Shaula	97 19.6	−37 04.5
18	Sirius	259 11.5	−16 39.2
33	Spica	159 16.4	−10 56.1
23	Suhail	223 24.2	−43 15.4
49	Vega	81 07.5	+38 44.9
39	Zub'g'bi	137 52.7	−15 51.8

Lat. N °	Sunrise h m	Twlt. begins h m
72	3 14	////
70	3 35	////
68	3 52	////
66	4 05	////
64	4 16	////
62	4 25	////
60	4 33	0 42
58	4 40	1 33
56	4 46	2 01
54	4 52	2 22
52	4 57	2 39
50	5 01	2 53
45	5 11	3 20
40	5 19	3 39
35	5 26	3 55
30	5 32	4 07
20	5 42	4 26
10	5 51	4 39
0	5 59	4 49
10	6 07	4 57
20	6 16	5 03
30	6 25	5 07
35	6 31	5 07
40	6 37	5 08
45	6 44	5 08
50	6 53	5 07
52	6 57	5 06
54	7 01	5 04
56	7 06	5 03
58	7 11	5 02
60	7 17	5 00
S		

Moonrise	22	23	24	25
	h m	h m	h m	h m
72	19 12	18 58	18 44	18 26
70	19 10	19 02	18 53	18 45
68	19 08	19 05	19 02	18 59
66	19 06	19 07	19 08	19 11
64	19 04	19 09	19 14	19 21
62	19 03	19 11	19 19	19 29
60	19 02	19 12	19 24	19 37
58	19 01	19 14	19 28	19 44
56	19 00	19 15	19 31	19 49
54	18 59	19 16	19 34	19 55
52	18 58	19 17	19 37	19 59
50	18 58	19 18	19 40	20 04
45	18 56	19 20	19 45	20 13
40	18 55	19 22	19 50	20 21
35	18 54	19 24	19 54	20 27
30	18 53	19 25	19 58	20 33
20	18 51	19 28	20 05	20 44
10	18 50	19 30	20 10	20 53
0	18 49	19 32	20 16	21 02
10	18 47	19 34	20 21	21 10
20	18 46	19 36	20 27	21 20
30	18 44	19 38	20 34	21 31
35	18 43	19 40	20 38	21 37
40	18 42	19 42	20 42	21 44
45	18 41	19 44	20 47	21 52
50	18 40	19 46	20 53	22 02
52	18 39	19 47	20 56	22 07
54	18 38	19 48	20 59	22 12
56	18 37	19 50	21 03	22 18
58	18 36	19 51	21 07	22 24
60	18 35	19 53	21 11	22 32

Lat. N °	Sunset h m	Twlt. ends h m
72	20 47	////
70	20 27	////
68	20 11	////
66	19 58	////
64	19 47	////
62	19 38	////
60	19 30	23 08
58	19 23	22 25
56	19 17	21 58
54	19 12	21 38
52	19 07	21 22
50	19 03	21 09
45	18 53	20 42
40	18 45	20 23
35	18 39	20 09
30	18 33	19 57
20	18 23	19 39
10	18 14	19 26
0	18 06	19 16
10	17 58	19 09
20	17 50	19 04
30	17 40	19 00
35	17 35	19 00
40	17 29	19 00
45	17 22	19 00
50	17 13	19 01
52	17 09	19 02
54	17 05	19 04
56	17 00	19 05
58	16 55	19 07
60	16 49	19 09
S		

Moonset	22	23	24	25
	h m	h m	h m	h m
72	5 30	7 14	9 01	10 52
70	5 36	7 14	8 53	10 36
68	5 42	7 13	8 47	10 23
66	5 46	7 13	8 41	10 12
64	5 50	7 13	8 37	10 03
62	5 53	7 12	8 33	9 56
60	5 56	7 12	8 30	9 49
58	5 58	7 12	8 27	9 43
56	6 00	7 12	8 24	9 38
54	6 02	7 12	8 22	9 34
52	6 04	7 11	8 20	9 30
50	6 06	7 11	8 18	9 26
45	6 09	7 11	8 14	9 18
40	6 12	7 11	8 10	9 12
35	6 14	7 11	8 07	9 06
30	6 16	7 10	8 05	9 01
20	6 20	7 10	8 00	8 52
10	6 23	7 10	7 56	8 45
0	6 26	7 09	7 53	8 38
10	6 30	7 09	7 49	8 30
20	6 33	7 08	7 45	8 23
30	6 36	7 08	7 40	8 14
35	6 38	7 08	7 38	8 09
40	6 41	7 08	7 35	8 04
45	6 43	7 07	7 31	7 57
50	6 46	7 07	7 27	7 50
52	6 48	7 07	7 26	7 46
54	6 49	7 06	7 24	7 42
56	6 51	7 06	7 21	7 38
58	6 53	7 06	7 19	7 33
60	6 55	7 05	7 16	7 28

G M T	Equation of Time (App.—Mean) 22	23	24
h	m s	m s	m s
0	− 2 55.3	− 2 40.0	− 2 24.3
6	− 2 51.6	− 2 36.1	− 2 20.3
12	− 2 47.7	− 2 32.2	− 2 16.3
18	− 2 43.9	− 2 28.3	− 2 12.2
24	− 2 40.0	− 2 24.3	− 2 08.1

GMT of Transit Meridian of Greenwich	DAY	Moon	Venus	Mars	Jupiter	Saturn
		h m	h m	h m	h m	h m
	22	0 16	8 56	1 42	12 42	17 35
	23	0 59	8 56	1 38	12 39	17 31
	24	1 42	8 55	1 33	12 35	17 28
	25	2 27	8 55	1 29	12 32	17 24

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb **Add**	Venus **Add**	Mars **Add**
°	′	′	′
0	0.1	0.2	0.4
30	0.1	0.2	0.3
45	0.1	0.1	0.2
60	0.1	0.1	0.1
75	0.1	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	22	23	24
°	′	′	′
0	12.6	13.1	13.6
4	12.6	13.1	13.7
8	12.7	13.2	13.7
12	12.7	13.2	13.7
16	12.7	13.2	13.7
20	12.8	13.3	13.8
24	12.9	13.3	13.8
28	12.9	13.4	13.8
32	13.0	13.5	13.9
36	13.1	13.5	14.0
40	13.2	13.6	14.0
44	13.3	13.7	14.1
48	13.4	13.8	14.2
52	13.6	13.9	14.3
56	13.7	14.0	14.3
60	13.8	14.1	14.4
64	14.0	14.3	14.5
68	14.1	14.4	14.6
72	14.3	14.5	14.7
76	14.4	14.6	14.8
80	14.6	14.8	14.9
84	14.8	14.9	15.0
88	14.9	15.0	15.1
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	22	23	24
°	′	′	′
0	17.2	16.9	16.6
4	17.2	16.9	16.6
8	17.2	16.9	16.6
12	17.2	16.9	16.6
16	17.1	16.8	16.6
20	17.1	16.8	16.5
24	17.0	16.7	16.5
28	16.9	16.7	16.4
32	16.8	16.6	16.4
36	16.7	16.5	16.3
40	16.6	16.4	16.3
44	16.5	16.4	16.2
48	16.4	16.3	16.1
52	16.3	16.2	16.0
56	16.1	16.0	15.9
60	16.0	15.9	15.8
64	15.9	15.8	15.8
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.5
80	15.2	15.3	15.4
84	15.1	15.2	15.2
88	15.0	15.1	15.2
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −4.0 GHA	Dec.	MARS −2.4 GHA	Dec.	JUPITER −1.2 GHA	Dec.	SATURN 0.8 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
25 0	333 13.9	226 10.9	+19 05.4	337 48.4	− 8 46.3	171 32.3	+ 8 48.0	98 23.3	−17 32.8	324 29.2	136	+ 8 05.3	+109
1	348 16.4	241 10.9	05.3	352 51.3	46.5	186 34.2	47.8	113 25.7	32.9	339 01.8	136	8 16.2	+108
2	3 18.8	256 11.0	05.3	7 54.1	46.7	201 36.2	47.6	128 28.0	32.9	353 34.4	135	8 27.0	+107
3	18 21.3	271 11.0	·· 05.2	22 57.0	·· 46.9	216 38.1	·· 47.4	143 30.4	·· 32.9	8 06.9	134	· 8 37.7	+107
4	33 23.7	286 11.1	05.2	37 59.9	47.1	231 40.1	47.2	158 32.7	33.0	22 39.3	135	8 48.4	+107
5	48 26.2	301 11.1	05.1	53 02.8	47.2	246 42.0	47.0	173 35.1	33.0	37 11.8	133	8 59.1	+107
6	63 28.7	316 11.2	+19 05.1	68 05.7	− 8 47.4	261 44.0	+ 8 46.8	188 37.5	−17 33.0	51 44.1	134	+ 9 09.8	+106
7	78 31.1	331 11.3	05.0	83 08.6	47.6	276 46.0	46.6	203 39.8	33.1	66 16.5	132	9 20.4	+106
8	93 33.6	346 11.3	05.0	98 11.4	47.8	291 47.9	46.4	218 42.2	33.1	80 48.7	132	9 31.0	+106
9	108 36.1	1 11.4	·· 04.9	113 14.3	·· 48.0	306 49.9	·· 46.2	233 44.6	·· 33.1	95 20.9	132	· 9 41.6	+105
10	123 38.5	16 11.4	04.8	128 17.2	48.2	321 51.8	46.0	248 46.9	33.2	109 53.1	131	9 52.1	+105
11	138 41.0	31 11.5	04.8	143 20.1	48.4	336 53.8	45.8	263 49.3	33.2	124 25.2	131	10 02.6	+104
12	153 43.5	46 11.5	+19 04.7	158 23.0	− 8 48.6	351 55.8	+ 8 45.6	278 51.6	−17 33.2	138 57.3	130	+10 13.0	+104
13	168 45.9	61 11.6	04.7	173 25.9	48.8	6 57.7	45.4	293 54.0	33.3	153 29.3	129	10 23.4	+104
14	183 48.4	76 11.6	04.6	188 28.8	49.0	21 59.7	45.2	308 56.4	33.3	168 01.2	129	10 33.8	+103
15	198 50.9	91 11.6	·· 04.6	203 31.7	·· 49.2	37 01.6	·· 45.0	323 58.7	·· 33.3	182 33.1	128	·10 44.1	+103
16	213 53.3	106 11.7	04.5	218 34.6	49.4	52 03.6	44.8	339 01.1	33.4	197 04.9	128	10 54.4	+102
17	228 55.8	121 11.7	04.4	233 37.5	49.6	67 05.5	44.6	354 03.5	33.4	211 36.7	127	11 04.6	+102
18	243 58.2	136 11.8	+19 04.4	248 40.3	− 8 49.8	82 07.5	+ 8 44.4	9 05.8	−17 33.4	226 08.4	127	+11 14.8	+101
19	259 00.7	151 11.8	04.3	263 43.2	50.0	97 09.5	44.2	24 08.2	33.5	240 40.1	125	11 24.9	+101
20	274 03.2	166 11.9	04.2	278 46.1	50.2	112 11.4	44.0	39 10.5	33.5	255 11.6	126	11 35.0	+101
21	289 05.6	181 11.9	·· 04.2	293 49.0	·· 50.4	127 13.4	·· 43.8	54 12.9	·· 33.5	269 43.2	125	·11 45.1	+100
22	304 08.1	196 11.9	04.1	308 51.9	50.6	142 15.3	43.6	69 15.3	33.6	284 14.7	124	11 55.1	+ 99
23	319 10.6	211 12.0	04.0	323 54.8	50.8	157 17.3	43.4	84 17.6	33.6	298 46.1	123	12 05.0	+ 99
26 0	334 13.0	226 12.0	+19 04.0	338 57.7	− 8 51.0	172 19.3	+ 8 43.2	99 20.0	−17 33.6	313 17.4	123	+12 14.9	+ 99
1	349 15.5	241 12.1	03.9	354 00.7	51.2	187 21.2	43.0	114 22.3	33.7	327 48.7	122	12 24.8	+ 98
2	4 18.0	256 12.1	03.8	9 03.6	51.4	202 23.2	42.8	129 24.7	33.7	342 19.9	122	12 34.6	+ 97
3	19 20.4	271 12.1	·· 03.8	24 06.5	·· 51.6	217 25.1	·· 42.6	144 27.1	·· 33.7	356 51.1	121	·12 44.3	+ 97
4	34 22.9	286 12.2	03.7	39 09.4	51.8	232 27.1	42.4	159 29.4	33.8	11 22.2	120	12 54.0	+ 96
5	49 25.4	301 12.2	03.6	54 12.3	52.0	247 29.1	42.2	174 31.8	33.8	25 53.2	120	13 03.6	+ 96
6	64 27.8	316 12.2	+19 03.6	69 15.2	− 8 52.2	262 31.0	+ 8 42.0	189 34.1	−17 33.8	40 24.2	119	+13 13.2	+ 95
7	79 30.3	331 12.2	03.5	84 18.1	52.4	277 33.0	41.8	204 36.5	33.9	54 55.1	118	13 22.7	+ 95
8	94 32.7	346 12.3	03.4	99 21.0	52.6	292 34.9	41.6	219 38.9	33.9	69 25.9	118	13 32.2	+ 94
9	109 35.2	1 12.3	·· 03.4	114 23.9	·· 52.8	307 36.9	·· 41.4	234 41.2	·· 33.9	83 56.7	117	·13 41.6	+ 93
10	124 37.7	16 12.3	03.3	129 26.8	53.0	322 38.8	41.1	249 43.6	34.0	98 27.4	116	13 50.9	+ 93
11	139 40.1	31 12.4	03.2	144 29.8	53.2	337 40.8	40.9	264 45.9	34.0	112 58.0	116	14 00.2	+ 92
12	154 42.6	46 12.4	+19 03.1	159 32.7	− 8 53.4	352 42.8	+ 8 40.7	279 48.3	−17 34.0	127 28.6	115	+14 09.4	+ 92
13	169 45.1	61 12.4	03.1	174 35.6	53.6	7 44.7	40.5	294 50.7	34.1	141 59.1	114	14 18.6	+ 91
14	184 47.5	76 12.4	03.0	189 38.5	53.8	22 46.7	40.3	309 53.0	34.1	156 29.5	114	14 27.7	+ 90
15	199 50.0	91 12.4	·· 02.9	204 41.4	·· 54.0	37 48.6	·· 40.1	324 55.4	·· 34.1	170 59.9	113	·14 36.7	+ 90
16	214 52.5	106 12.5	02.8	219 44.3	54.2	52 50.6	39.9	339 57.7	34.2	185 30.2	112	14 45.7	+ 89
17	229 54.9	121 12.5	02.7	234 47.3	54.4	67 52.6	39.7	355 00.1	34.2	200 00.4	111	14 54.6	+ 88
18	244 57.4	136 12.5	+19 02.7	249 50.2	− 8 54.6	82 54.5	+ 8 39.5	10 02.4	−17 34.2	214 30.5	111	+15 03.4	+ 87
19	259 59.8	151 12.5	02.6	264 53.1	54.8	97 56.5	39.3	25 04.8	34.3	229 00.6	110	15 12.1	+ 87
20	275 02.3	166 12.5	02.5	279 56.0	55.0	112 58.4	39.1	40 07.2	34.3	243 30.6	109	15 20.8	+ 86
21	290 04.8	181 12.6	·· 02.4	294 59.0	·· 55.2	128 00.4	·· 38.9	55 09.5	·· 34.3	258 00.5	109	·15 29.4	+ 86
22	305 07.2	196 12.6	02.3	310 01.9	55.4	143 02.3	38.7	70 11.9	34.4	272 30.4	108	15 38.0	+ 85
23	320 09.7	211 12.6	02.3	325 04.8	55.6	158 04.3	38.5	85 14.2	34.4	287 00.2	107	15 46.5	+ 84
27 0	335 12.2	226 12.6	+19 02.2	340 07.8	− 8 55.8	173 06.3	+ 8 38.3	100 16.6	−17 34.4	301 29.9	106	+15 54.9	+ 83
1	350 14.6	241 12.6	02.1	355 10.7	56.0	188 08.2	38.1	115 18.9	34.5	315 59.5	106	16 03.2	+ 82
2	5 17.1	256 12.6	02.0	10 13.6	56.2	203 10.2	37.9	130 21.3	34.5	330 29.1	105	16 11.4	+ 82
3	20 19.6	271 12.6	·· 01.9	25 16.6	·· 56.4	218 12.1	·· 37.7	145 23.7	·· 34.5	344 58.6	104	·16 19.6	+ 81
4	35 22.0	286 12.7	01.8	40 19.5	56.6	233 14.1	37.5	160 26.0	34.6	359 28.0	103	16 27.7	+ 80
5	50 24.5	301 12.7	01.8	55 22.4	56.8	248 16.0	37.3	175 28.4	34.6	13 57.3	103	16 35.7	+ 79
6	65 27.0	316 12.7	+19 01.7	70 25.4	− 8 57.0	263 18.0	+ 8 37.1	190 30.7	−17 34.7	28 26.6	102	+16 43.6	+ 78
7	80 29.4	331 12.7	01.6	85 28.3	57.2	278 20.0	36.9	205 33.1	34.7	42 55.8	101	16 51.4	+ 78
8	95 31.9	346 12.7	01.5	100 31.2	57.4	293 21.9	36.7	220 35.4	34.7	57 24.9	101	16 59.2	+ 77
9	110 34.3	1 12.7	·· 01.4	115 34.2	·· 57.6	308 23.9	·· 36.5	235 37.8	·· 34.8	71 54.0	99	·17 06.9	+ 76
10	125 36.8	16 12.7	01.3	130 37.1	57.8	323 25.8	36.3	250 40.1	34.8	86 22.9	99	17 14.5	+ 75
11	140 39.3	31 12.7	01.2	145 40.1	58.0	338 27.8	36.1	265 42.5	34.8	100 51.8	98	17 22.0	+ 74
12	155 41.7	46 12.7	+19 01.1	160 43.0	− 8 58.3	353 29.8	+ 8 35.9	280 44.9	−17 34.9	115 20.6	98	+17 29.4	+ 73
13	170 44.2	61 12.7	01.0	175 45.9	58.5	8 31.7	35.7	295 47.2	34.9	129 49.4	96	17 36.7	+ 73
14	185 46.7	76 12.7	00.9	190 48.9	58.7	23 33.7	35.5	310 49.6	34.9	144 18.0	96	17 44.0	+ 71
15	200 49.1	91 12.7	·· 00.8	205 51.8	·· 58.9	38 35.6	·· 35.3	325 51.9	·· 35.0	158 46.6	95	·17 51.1	+ 71
16	215 51.6	106 12.7	00.8	220 54.8	59.1	53 37.6	35.0	340 54.3	35.0	173 15.1	94	17 58.2	+ 69
17	230 54.1	121 12.7	00.7	235 57.7	59.3	68 39.5	34.8	355 56.6	35.0	187 43.5	94	18 05.1	+ 69
18	245 56.5	136 12.7	+19 00.6	251 00.7	− 8 59.5	83 41.5	+ 8 34.6	10 59.0	−17 35.1	202 11.9	93	+18 12.0	+ 68
19	260 59.0	151 12.7	00.5	266 03.6	59.7	98 43.5	34.4	26 01.3	35.1	216 40.2	92	18 18.8	+ 67
20	276 01.5	166 12.7	00.4	281 06.6	8 59.9	113 45.4	34.2	41 03.7	35.1	231 08.4	91	18 25.5	+ 66
21	291 03.9	181 12.7	·· 00.3	296 09.5	· 9 00.1	128 47.4	·· 34.0	56 06.0	·· 35.2	245 36.5	91	·18 32.1	+ 64
22	306 06.4	196 12.7	00.2	311 12.5	00.3	143 49.3	33.8	71 08.4	35.2	260 04.6	89	18 38.5	+ 64
23	321 08.8	211 12.7	00.1	326 15.4	00.5	158 51.3	33.6	86 10.7	35.2	274 32.5	89	18 44.9	+ 63
24	336 11.3	226 12.7	+19 00.0	341 18.4	− 9 00.7	173 53.3	+ 8 33.4	101 13.1	−17 35.3	289 00.4	89	+18 51.2	+ 62
code	—	0	0	+ 29	− 2	+ 19	− 2	+ 24	− 1				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
25 0	179 28.1	+10 51.1	7	Acamar	315 50.5	−40 28.3
1	194 28.2	50.2	5	Achernar	335 58.0	−57 27.0
2	209 28.4	49.4	30	Acrux	173 57.5	−62 51.8
3	224 28.6	·· 48.5	19	Adhara	255 46.2	−28 54.6
4	239 28.7	47.7	10	Aldebaran	291 38.3	+16 25.4
5	254 28.9	46.8				
6	269 29.1	+10 45.9	32	Alioth	166 58.4	+56 11.8
7	284 29.3	45.1	34	Alkaid	153 32.6	+49 32.0
8	299 29.4	44.2	55	Al Na'ir	28 36.6	−47 10.1
9	314 29.6	·· 43.3	15	Alnilam	276 29.7	− 1 13.6
10	329 29.8	42.5	25	Alphard	218 38.2	− 8 28.2
11	344 29.9	41.6				
12	359 30.1	+10 40.8	41	Alphecca	126 47.1	+26 51.8
13	14 30.3	39.9	1	Alpheratz	358 27.3	+28 51.2
14	29 30.5	39.0	51	Altair	62 49.5	+ 8 45.4
15	44 30.6	·· 38.2	2	Ankaa	353 57.3	−42 32.2
16	59 30.8	37.3	42	Antares	113 18.5	−26 20.3
17	74 31.0	36.4				
18	89 31.2	+10 35.6	37	Arcturus	146 34.7	+19 24.6
19	104 31.3	34.7	43	Atria	108 58.4	−68 57.3
20	119 31.5	33.8	22	Avior	234 36.0	−59 22.1
21	134 31.7	·· 33.0	13	Bellatrix	279 17.8	+ 6 18.8
22	149 31.9	32.1	16	Betelg'se	271 47.5	+ 7 24.1
23	164 32.0	31.2				
			17	Canopus	264 15.4	−52 40.1
26 0	179 32.2	+10 30.4	12	Capella	281 37.5	+45 57.2
1	194 32.4	29.5	53	Deneb	50 00.1	+45 07.8
2	209 32.6	28.6	28	Denebola	183 17.3	+14 48.9
3	224 32.7	·· 27.8	4	Diphda	349 38.3	−18 13.2
4	239 32.9	26.9				
5	254 33.1	26.0	27	Dubhe	194 44.4	+61 59.1
6	269 33.3	+10 25.2	14	Elnath	279 06.6	+28 34.3
7	284 33.4	24.3	47	Eltanin	91 05.7	+51 30.0
8	299 33.6	23.4	54	Enif	34 28.6	+ 9 40.8
9	314 33.8	·· 22.5	56	Fomalhaut	16 10.5	−29 50.9
10	329 34.0	21.7				
11	344 34.1	20.8	31	Gacrux	172 48.9	−56 52.4
12	359 34.3	+10 19.9	29	Gienah	176 36.4	−17 18.1
13	14 34.5	19.1	35	Hadar	149 48.7	−60 10.1
14	29 34.7	18.2	6	Hamal	328 48.7	+23 15.6
15	44 34.8	·· 17.3	48	Kaus Aust.	84 40.0	−34 24.4
16	59 35.0	16.4				
17	74 35.2	15.6	40	Kochab	137 18.4	+74 20.3
18	89 35.4	+10 14.7	57	Markab	14 20.4	+14 58.5
19	104 35.6	13.8	8	Menkar	314 59.5	+ 3 55.4
20	119 35.7	13.0	36	Menkent	148 58.0	−36 09.6
21	134 35.9	·· 12.1	24	Miapl'dus	221 49.7	−69 32.3
22	149 36.1	11.2				
23	164 36.3	10.3	9	Mirfak	309 41.3	+49 42.4
			50	Nunki	76 50.8	−26 21.1
27 0	179 36.4	+10 09.5	52	Peacock	54 25.7	−56 52.5
1	194 36.6	08.6	21	Pollux	244 20.0	+28 07.9
2	209 36.8	07.7	20	Procyon	245 44.5	+ 5 20.3
3	224 37.0	·· 06.8				
4	239 37.2	06.0	46	R'alhague	96 45.8	+12 35.6
5	254 37.3	05.1	26	Regulus	208 29.1	+12 10.8
6	269 37.5	+10 04.2	11	Rigel	281 53.1	− 8 14.9
7	284 37.7	03.3	38	Rigil Kent.	140 50.2	−60 39.7
8	299 37.9	02.5	44	Sabik	103 01.3	−15 40.3
9	314 38.1	·· 01.6				
10	329 38.2	10 00.7	3	Schedar	350 28.7	+56 18.0
11	344 38.4	9 59.8	45	Shaula	97 19.6	−37 04.5
12	359 38.6	+ 9 58.9	18	Sirius	259 11.4	−16 39.2
13	14 38.8	58.1	33	Spica	159 16.4	−10 56.1
14	29 39.0	57.2	23	Suhail	223 24.2	−43 15.4
15	44 39.1	·· 56.3				
16	59 39.3	55.4	49	Vega	81 07.5	+38 44.9
17	74 39.5	54.5	39	Zub'g'bi	137 52.7	−15 51.8
18	89 39.7	+ 9 53.7				
19	104 39.9	52.8				
20	119 40.0	51.9				
21	134 40.2	·· 51.0				
22	149 40.4	50.1				
23	164 40.6	49.3				
24	179 40.8	+ 9 48.4				
code	—	− 8				

Lat. N °	Sunrise h m	Twlt. begins h m	Moonrise 25 h m	26 h m	27 h m	28 h m
72	3 30	////	18 26	18 01	16 48	▭
70	3 49	////	18 45	18 33	18 16	▭
68	4 03	////	18 59	18 57	18 56	18 59
66	4 15	////	19 11	19 15	19 24	19 40
64	4 25	////	19 21	19 30	19 45	20 09
62	4 33	////	19 29	19 43	20 02	20 31
60	4 40	1 13	19 37	19 54	20 16	20 48
58	4 47	1 50	19 44	20 03	20 28	21 03
56	4 52	2 13	19 49	20 11	20 39	21 16
54	4 57	2 33	19 55	20 19	20 48	21 27
52	5 02	2 47	19 59	20 25	20 57	21 37
50	5 06	3 00	20 04	20 31	21 04	21 46
45	5 15	3 25	20 13	20 44	21 21	22 05
40	5 22	3 43	20 21	20 55	21 34	22 20
35	5 28	3 57	20 27	21 04	21 45	22 33
30	5 34	4 09	20 33	21 12	21 55	22 44
20	5 43	4 27	20 44	21 26	22 13	23 04
10	5 51	4 40	20 53	21 39	22 28	23 21
0	5 58	4 49	21 02	21 50	22 42	23 37
10	6 06	4 55	21 10	22 02	22 56	23 53
20	6 14	5 00	21 20	22 14	23 11	24 10
30	6 22	5 03	21 31	22 29	23 29	24 29
35	6 27	5 03	21 37	22 37	23 39	24 41
40	6 33	5 04	21 44	22 47	23 51	24 54
45	6 39	5 03	21 52	22 58	24 05	0 05
50	6 47	5 01	22 02	23 12	24 22	0 22
52	6 51	4 59	22 07	23 19	24 30	0 30
54	6 54	4 58	22 12	23 26	24 39	0 39
56	6 59	4 56	22 18	23 34	24 49	0 49
58	7 04	4 54	22 24	23 43	25 01	1 01
60	7 09	4 51	22 32	23 53	25 14	1 14

Lat. N °	Sunset h m	Twlt. ends h m	Moonset 25 h m	26 h m	27 h m	28 h m
72	20 29	////	10 52	12 56	15 54	▭
70	20 11	////	10 36	12 26	14 28	▭
68	19 58	////	10 23	12 03	13 49	15 39
66	19 46	////	10 12	11 46	13 22	14 57
64	19 37	////	10 03	11 32	13 02	14 29
62	19 28	////	9 56	11 20	12 45	14 08
60	19 21	22 40	9 49	11 10	12 31	13 50
58	19 15	22 08	9 43	11 01	12 20	13 36
56	19 10	21 45	9 38	10 54	12 09	13 23
54	19 05	21 27	9 34	10 47	12 00	13 12
52	19 01	21 13	9 30	10 41	11 52	13 03
50	18 57	21 01	9 26	10 35	11 45	12 54
45	18 48	20 36	9 18	10 24	11 30	12 36
40	18 41	20 18	9 12	10 14	11 17	12 21
35	18 35	20 04	9 06	10 06	11 07	12 09
30	18 29	19 52	9 01	9 58	10 57	11 58
20	18 20	19 36	8 52	9 46	10 41	11 39
10	18 12	19 23	8 45	9 35	10 27	11 23
0	18 05	19 15	8 38	9 25	10 14	11 08
10	17 58	19 09	8 30	9 14	10 01	10 52
20	17 50	19 04	8 23	9 03	9 48	10 36
30	17 42	19 02	8 14	8 51	9 32	10 18
35	17 37	19 02	8 09	8 44	9 23	10 07
40	17 31	19 01	8 04	8 36	9 12	9 54
45	17 25	19 03	7 57	8 26	9 00	9 40
50	17 17	19 05	7 50	8 15	8 45	9 22
52	17 14	19 07	7 46	8 10	8 38	9 14
54	17 10	19 08	7 42	8 04	8 30	9 04
56	17 06	19 10	7 38	7 58	8 22	8 54
58	17 01	19 12	7 33	7 50	8 12	8 42
60	16 56	19 16	7 28	7 42	8 01	8 28

GMT h	Equation of Time (App.—Mean) 25 m s	26 m s	27 m s
0	− 2 08.1	− 1 51.5	− 1 34.6
6	− 2 04.0	− 1 47.3	− 1 30.3
12	− 1 59.9	− 1 43.1	− 1 26.0
18	− 1 55.7	− 1 38.9	− 1 21.6
24	− 1 51.5	− 1 34.6	− 1 17.3

GMT of Transit Meridian of Greenwich DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
25	2 27	8 55	1 29	12 32	17 24
26	3 13	8 55	1 24	12 29	17 20
27	4 02	8 55	1 19	12 26	17 16
28	4 55	8 55	1 15	12 23	17 12

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.2	0.2	0.4
30	0.2	0.2	0.3
45	0.2	0.1	0.2
60	0.2	0.1	0.1
75	0.2	0.0	0.0
90			

Moon's Lower Limb Add

Alt. °	25 ′	26 ′	27 ′
0	14.3	15.0	15.8
4	14.3	15.0	15.8
8	14.3	15.0	15.8
12	14.3	15.1	15.8
16	14.3	15.1	15.8
20	14.4	15.1	15.8
24	14.4	15.1	15.8
28	14.4	15.1	15.8
32	14.4	15.1	15.8
36	14.5	15.1	15.8
40	14.5	15.1	15.8
44	14.6	15.2	15.7
48	14.6	15.2	15.7
52	14.7	15.2	15.7
56	14.7	15.2	15.7
60	14.8	15.3	15.7
64	14.9	15.3	15.7
68	14.9	15.3	15.7
72	15.0	15.3	15.7
76	15.1	15.4	15.6
80	15.1	15.4	15.6
84	15.2	15.4	15.6
88	15.3	15.4	15.6
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt. °	25 ′	26 ′	27 ′
0	16.3	15.8	15.4
4	16.3	15.8	15.4
8	16.3	15.8	15.4
12	16.2	15.8	15.4
16	16.2	15.8	15.4
20	16.2	15.8	15.4
24	16.2	15.8	15.4
28	16.1	15.8	15.4
32	16.1	15.8	15.4
36	16.1	15.8	15.4
40	16.0	15.7	15.5
44	16.0	15.7	15.5
48	15.9	15.7	15.5
52	15.9	15.7	15.5
56	15.8	15.7	15.5
60	15.7	15.6	15.5
64	15.7	15.6	15.5
68	15.6	15.6	15.5
72	15.6	15.6	15.6
76	15.5	15.5	15.6
80	15.4	15.5	15.6
84	15.3	15.5	15.6
88	15.3	15.4	15.6
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −4.0 GHA	Dec	MARS −2.5 GHA	Dec	JUPITER −1.2 GHA	Dec	SATURN 0.8 GHA	Dec	MOON GHA	code	Dec	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
28 0	336 11.3	226 12.7	+19 00.0	341 18.4	− 9 00.7	173 53.3	+ 8 33.4	101 13.1	−17 35.3	289 00.4	89	+18 51.2	+ 62
1	351 13.8	241 12.7	18 59.9	356 21.3	00.9	188 55.2	33.2	116 15.4	35.3	303 28.3	87	18 57.4	+ 61
2	6 16.2	256 12.6	59.8	11 24.3	01.1	203 57.2	33.0	131 17.8	35.3	317 56.0	87	19 03.5	+ 60
3	21 18.7	271 12.6	·· 59.7	26 27.3	·· 01.3	218 59.1	·· 32.8	146 20.2	·· 35.4	332 23.7	86	·19 09.5	+ 59
4	36 21.2	286 12.6	59.6	41 30.2	01.5	234 01.1	32.6	161 22.5	35.4	346 51.3	85	19 15.4	+ 58
5	51 23.6	301 12.6	59.5	56 33.2	01.7	249 03.0	32.4	176 24.9	35.5	1 18.8	85	19 21.2	+ 56
6	66 26.1	316 12.6	+18 59.4	71 36.1	− 9 02.0	264 05.0	+ 8 32.2	191 27.2	−17 35.5	15 46.3	83	+19 26.8	+ 56
7	81 28.6	331 12.6	59.3	86 39.1	02.2	279 07.0	32.0	206 29.6	35.5	30 13.6	83	19 32.4	+ 54
8	96 31.0	346 12.6	59.1	101 42.1	02.4	294 08.9	31.8	221 31.9	35.6	44 40.9	83	19 37.8	+ 54
9	111 33.5	1 12.6	·· 59.0	116 45.0	·· 02.6	309 10.9	·· 31.6	236 34.3	·· 35.6	59 08.2	81	·19 43.2	+ 52
10	126 35.9	16 12.5	58.9	131 48.0	02.8	324 12.8	31.4	251 36.6	35.6	73 35.3	81	19 48.4	+ 52
11	141 38.4	31 12.5	58.8	146 51.0	03.0	339 14.8	31.2	266 39.0	35.7	88 02.4	80	19 53.6	+ 50
12	156 40.9	46 12.5	+18 58.7	161 53.9	− 9 03.2	354 16.7	+ 8 31.0	281 41.3	−17 35.7	102 29.4	80	+19 58.6	+ 49
13	171 43.3	61 12.5	58.6	176 56.9	03.4	9 18.7	30.8	296 43.7	35.7	116 56.4	78	20 03.5	+ 48
14	186 45.8	76 12.5	58.5	191 59.9	03.6	24 20.7	30.6	311 46.0	35.8	131 23.2	78	20 08.3	+ 46
15	201 48.3	91 12.4	·· 58.4	207 02.8	·· 03.8	39 22.6	·· 30.4	326 48.4	·· 35.8	145 50.0	77	·20 12.9	+ 46
16	216 50.7	106 12.4	58.3	222 05.8	04.0	54 24.6	30.2	341 50.7	35.8	160 16.7	77	20 17.5	+ 44
17	231 53.2	121 12.4	58.2	237 08.8	04.2	69 26.5	30.0	356 53.1	35.9	174 43.4	76	20 21.9	+ 44
18	246 55.7	136 12.4	+18 58.1	252 11.8	− 9 04.4	84 28.5	+ 8 29.8	11 55.4	−17 35.9	189 10.0	75	+20 26.3	+ 42
19	261 58.1	151 12.3	57.9	267 14.7	04.6	99 30.5	29.5	26 57.8	35.9	203 36.5	74	20 30.5	+ 40
20	277 00.6	166 12.3	57.8	282 17.7	04.9	114 32.4	29.3	42 00.1	36.0	218 02.9	74	20 34.5	+ 40
21	292 03.1	181 12.3	·· 57.7	297 20.7	·· 05.1	129 34.4	·· 29.1	57 02.5	·· 36.0	232 29.3	73	·20 38.5	+ 39
22	307 05.5	196 12.3	57.6	312 23.7	05.3	144 36.3	28.9	72 04.8	36.1	246 55.6	73	20 42.4	+ 37
23	322 08.0	211 12.2	57.5	327 26.6	05.5	159 38.3	28.7	87 07.2	36.1	261 21.9	72	20 46.1	+ 36
29 0	337 10.4	226 12.2	+18 57.4	342 29.6	− 9 05.7	174 40.2	+ 8 28.5	102 09.5	−17 36.1	275 48.1	71	+20 49.7	+ 35
1	352 12.9	241 12.2	57.2	357 32.6	05.9	189 42.2	28.3	117 11.9	36.2	290 14.2	70	20 53.2	+ 33
2	7 15.4	256 12.1	57.1	12 35.6	06.1	204 44.2	28.1	132 14.2	36.2	304 40.2	70	20 56.5	+ 32
3	22 17.8	271 12.1	·· 57.0	27 38.6	·· 06.3	219 46.1	·· 27.9	147 16.6	·· 36.2	319 06.2	69	·20 59.7	+ 31
4	37 20.3	286 12.1	56.9	42 41.6	06.5	234 48.1	27.7	162 18.9	36.3	333 32.1	69	21 02.8	+ 30
5	52 22.8	301 12.0	56.8	57 44.5	06.7	249 50.0	27.5	177 21.3	36.3	347 58.0	68	21 05.8	+ 28
6	67 25.2	316 12.0	+18 56.6	72 47.5	− 9 06.9	264 52.0	+ 8 27.3	192 23.6	−17 36.3	2 23.8	68	+21 08.6	+ 27
7	82 27.7	331 12.0	56.5	87 50.5	07.2	279 53.9	27.1	207 25.9	36.4	16 49.6	66	21 11.3	+ 26
8	97 30.2	346 11.9	56.4	102 53.5	07.4	294 55.9	26.9	222 28.3	36.4	31 15.2	67	21 13.9	+ 25
9	112 32.6	1 11.9	·· 56.3	117 56.5	·· 07.6	309 57.9	·· 26.7	237 30.6	·· 36.5	45 40.9	65	·21 16.4	+ 23
10	127 35.1	16 11.9	56.1	132 59.5	07.8	324 59.8	26.5	252 33.0	36.5	60 06.4	65	21 18.7	+ 22
11	142 37.6	31 11.8	56.0	148 02.5	08.0	340 01.8	26.3	267 35.3	36.5	74 31.9	65	21 20.9	+ 21
12	157 40.0	46 11.8	+18 55.9	163 05.5	− 9 08.2	355 03.7	+ 8 26.1	282 37.7	−17 36.6	88 57.4	64	+21 23.0	+ 19
13	172 42.5	61 11.7	55.8	178 08.4	08.4	10 05.7	25.9	297 40.0	36.6	103 22.8	64	21 24.9	+ 18
14	187 44.9	76 11.7	55.6	193 11.4	08.6	25 07.6	25.7	312 42.4	36.6	117 48.2	62	21 26.7	+ 16
15	202 47.4	91 11.7	·· 55.5	208 14.4	·· 08.8	40 09.6	·· 25.5	327 44.7	·· 36.7	132 13.4	63	·21 28.3	+ 15
16	217 49.9	106 11.6	55.4	223 17.4	09.0	55 11.6	25.3	342 47.1	36.7	146 38.7	62	21 29.8	+ 14
17	232 52.3	121 11.6	55.3	238 20.4	09.2	70 13.5	25.1	357 49.4	36.7	161 03.9	61	21 31.2	+ 13
18	247 54.8	136 11.5	+18 55.1	253 23.4	− 9 09.5	85 15.5	+ 8 24.9	12 51.8	−17 36.8	175 29.0	61	+21 32.5	+ 11
19	262 57.3	151 11.5	55.0	268 26.4	09.7	100 17.4	24.7	27 54.1	36.8	189 54.1	61	21 33.6	+ 9
20	277 59.7	166 11.4	54.9	283 29.4	09.9	115 19.4	24.4	42 56.5	36.9	204 19.2	60	21 34.5	+ 9
21	293 02.2	181 11.4	·· 54.7	298 32.4	·· 10.1	130 21.4	·· 24.2	57 58.8	·· 36.9	218 44.2	59	·21 35.4	+ 7
22	308 04.7	196 11.3	54.6	313 35.4	10.3	145 23.3	24.0	73 01.1	36.9	233 09.1	60	21 36.1	+ 5
23	323 07.1	211 11.3	54.5	328 38.4	10.5	160 25.3	23.8	88 03.5	37.0	247 34.1	58	21 36.6	+ 4
30 0	338 09.6	226 11.3	+18 54.3	343 41.4	− 9 10.7	175 27.2	+ 8 23.6	103 05.8	−17 37.0	261 58.9	59	+21 37.0	+ 3
1	353 12.0	241 11.2	54.2	358 44.4	10.9	190 29.2	23.4	118 08.2	37.0	276 23.8	58	21 37.3	+ 2
2	8 14.5	256 11.2	54.1	13 47.4	11.1	205 31.1	23.2	133 10.5	37.1	290 48.6	57	21 37.5	− 1
3	23 17.0	271 11.1	·· 53.9	28 50.4	·· 11.3	220 33.1	·· 23.0	148 12.9	·· 37.1	305 13.3	57	·21 37.4	− 1
4	38 19.4	286 11.0	53.8	43 53.4	11.6	235 35.1	22.8	163 15.2	37.1	319 38.0	57	21 37.3	− 3
5	53 21.9	301 11.0	53.6	58 56.5	11.8	250 37.0	22.6	178 17.6	37.2	334 02.7	57	21 37.0	− 4
6	68 24.4	316 10.9	+18 53.5	73 59.5	− 9 12.0	265 39.0	+ 8 22.4	193 19.9	−17 37.2	348 27.4	56	+21 36.6	− 6
7	83 26.8	331 10.9	53.4	89 02.5	12.2	280 40.9	22.2	208 22.2	37.3	2 52.0	56	21 36.0	− 7
8	98 29.3	346 10.8	53.2	104 05.5	12.4	295 42.9	22.0	223 24.6	37.3	17 16.6	55	21 35.3	− 9
9	113 31.8	1 10.8	·· 53.1	119 08.5	·· 12.6	310 44.8	·· 21.8	238 26.9	·· 37.3	31 41.1	55	·21 34.4	− 10
10	128 34.2	16 10.7	52.9	134 11.5	12.8	325 46.8	21.6	253 29.3	37.4	46 05.6	55	21 33.4	− 12
11	143 36.7	31 10.7	52.8	149 14.5	13.0	340 48.8	21.4	268 31.6	37.4	60 30.1	55	21 32.2	− 13
12	158 39.2	46 10.6	+18 52.6	164 17.5	− 9 13.2	355 50.7	+ 8 21.2	283 34.0	−17 37.4	74 54.6	54	+21 30.9	− 14
13	173 41.6	61 10.5	52.5	179 20.5	13.5	10 52.7	21.0	298 36.3	37.5	89 19.0	55	21 29.5	− 16
14	188 44.1	76 10.5	52.4	194 23.6	13.7	25 54.6	20.8	313 38.7	37.5	103 43.5	54	21 27.9	− 17
15	203 46.5	91 10.4	·· 52.2	209 26.6	·· 13.9	40 56.6	·· 20.6	328 41.0	·· 37.5	118 07.9	53	·21 26.2	− 19
16	218 49.0	106 10.4	52.1	224 29.6	14.1	55 58.5	20.4	343 43.3	37.6	132 32.2	54	21 24.3	− 20
17	233 51.5	121 10.3	51.9	239 32.6	14.3	71 00.5	20.2	358 45.7	37.6	146 56.6	53	21 22.3	− 22
18	248 53.9	136 10.2	+18 51.8	254 35.6	− 9 14.5	86 02.5	+ 8 20.0	13 48.0	−17 37.7	161 20.9	53	+21 20.1	− 23
19	263 56.4	151 10.2	51.6	269 38.7	14.7	101 04.4	19.7	28 50.4	37.7	175 45.2	53	21 17.8	− 25
20	278 58.9	166 10.1	51.5	284 41.7	14.9	116 06.4	19.5	43 52.7	37.7	190 09.5	53	21 15.3	− 26
21	294 01.3	181 10.0	·· 51.3	299 44.7	·· 15.1	131 08.3	·· 19.3	58 55.0	·· 37.8	204 33.8	53	·21 12.7	− 27
22	309 03.8	196 10.0	51.2	314 47.7	15.4	146 10.3	19.1	73 57.4	37.8	218 58.1	53	21 10.0	− 29
23	324 06.3	211 09.9	51.0	329 50.7	15.6	161 12.2	18.9	88 59.7	37.8	233 22.4	52	21 07.1	− 30
24	339 08.7	226 09.8	+18 50.9	344 53.8	− 9 15.8	176 14.2	+ 8 18.7	104 02.1	−17 37.9	247 46.6	53	+21 04.1	− 32
code	—	− 1	− 1	+ 29	− 2	+ 20	− 2	+ 23	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
28 0	179 40.8	+ 9 48.4	7	Acamar	315 50.5	−40 28.3
1	194 41.0	47.5	5	Achernar	335 58.0	−57 27.0
2	209 41.1	46.6	30	Acrux	173 57.6	−62 51.7
3	224 41.3	·· 45.7	19	Adhara	255 46.2	−28 54.6
4	239 41.5	44.9	10	Aldebaran	291 38.3	+16 25.4
5	254 41.7	44.0				
6	269 41.9	+ 9 43.1	32	Alioth	166 58.4	+56 11.8
7	284 42.1	42.2	34	Alkaid	153 32.7	+49 31.9
8	299 42.2	41.3	55	Al Na'ir	28 36.6	−47 10.1
9	314 42.4	·· 40.4	15	Alnilam	276 29.7	− 1 13.6
10	329 42.6	39.6	25	Alphard	218 38.2	− 8 28.2
11	344 42.8	38.7				
12	359 43.0	+ 9 37.8	41	Alphecca	126 47.1	+26 51.8
13	14 43.2	36.9	1	Alpheratz	358 27.3	+28 51.2
14	29 43.3	36.0	51	Altair	62 49.5	+ 8 45.4
15	44 43.5	·· 35.1	2	Ankaa	353 57.3	−42 32.2
16	59 43.7	34.2	42	Antares	113 18.5	−26 20.3
17	74 43.9	33.4				
18	89 44.1	+ 9 32.5	37	Arcturus	146 34.7	+19 24.6
19	104 44.3	31.6	43	Atria	108 58.5	−68 57.3
20	119 44.5	30.7	22	Avior	234 36.0	−59 22.1
21	134 44.6	·· 29.8	13	Bellatrix	279 17.8	+ 6 18.8
22	149 44.8	28.9	16	Betelg'se	271 47.5	+ 7 24.1
23	164 45.0	28.0				
			17	Canopus	264 15.3	−52 40.1
29 0	179 45.2	+ 9 27.2	12	Capella	281 37.5	+45 57.2
1	194 45.4	26.3	53	Deneb	50 00.1	+45 07.8
2	209 45.6	25.4	28	Denebola	183 17.3	+14 48.9
3	224 45.8	·· 24.5	4	Diphda	349 38.3	−18 13.2
4	239 45.9	23.6				
5	254 46.1	22.7	27	Dubhe	194 44.4	+61 59.1
6	269 46.3	+ 9 21.8	14	Elnath	279 06.5	+28 34.3
7	284 46.5	20.9	47	Eltanin	91 05.7	+51 30.0
8	299 46.7	20.0	54	Enif	34 28.6	+ 9 40.8
9	314 46.9	·· 19.2	56	Fomalhaut	16 10.5	−29 50.9
10	329 47.1	18.3				
11	344 47.2	17.4	31	Gacrux	172 48.9	−56 52.4
12	359 47.4	+ 9 16.5	29	Gienah	176 36.4	−17 18.1
13	14 47.6	15.6	35	Hadar	149 48.7	−60 10.1
14	29 47.8	14.7	6	Hamal	328 48.7	+23 15.6
15	44 48.0	·· 13.8	48	Kaus Aust.	84 40.0	−34 24.4
16	59 48.2	12.9				
17	74 48.4	12.0	40	Kochab	137 18.5	+74 20.2
18	89 48.6	+ 9 11.1	57	Markab	14 20.4	+14 58.5
19	104 48.7	10.2	8	Menkar	314 59.5	+ 3 55.4
20	119 48.9	09.3	36	Menkent	148 58.0	−36 09.6
21	134 49.1	·· 08.5	24	Miapl'dus	221 49.7	−69 32.3
22	149 49.3	07.6				
23	164 49.5	06.7	9	Mirfak	309 41.2	+49 42.4
			50	Nunki	76 50.8	−26 21.1
30 0	179 49.7	+ 9 05.8	52	Peacock	54 25.7	−56 52.5
1	194 49.9	04.9	21	Pollux	244 20.0	+28 07.9
2	209 50.1	04.0	20	Procyon	245 44.5	+ 5 20.3
3	224 50.3	·· 03.1				
4	239 50.5	02.2	46	R'alhague	96 45.9	+12 35.6
5	254 50.6	01.3	26	Regulus	208 29.1	+12 10.8
6	269 50.8	+ 9 00.4	11	Rigel	281 53.0	− 8 14.9
7	284 51.0	8 59.5	38	Rigil Kent.	140 50.3	−60 39.7
8	299 51.2	58.6	44	Sabik	103 01.3	−15 40.3
9	314 51.4	·· 57.7				
10	329 51.6	56.8	3	Schedar	350 28.7	+56 18.0
11	344 51.8	55.9	45	Shaula	97 19.6	−37 04.5
12	359 52.0	+ 8 55.0	18	Sirius	259 11.4	−16 39.2
13	14 52.2	54.1	33	Spica	159 16.4	−10 56.1
14	29 52.4	53.2	23	Suhail	223 24.2	−43 15.4
15	44 52.5	·· 52.3				
16	59 52.7	51.4	49	Vega	81 07.6	+38 44.9
17	74 52.9	50.5	39	Zub'g'bi	137 52.7	−15 51.8
18	89 53.1	+ 8 49.6				
19	104 53.3	48.7				
20	119 53.5	47.8				
21	134 53.7	·· 46.9				
22	149 53.9	46.0				
23	164 54.1	45.1				
24	179 54.3	+ 8 44.2				
code	—	− 9				

GMT	Equation of Time (App.—Mean) 28	29	30
h	m s	m s	m s
0	− 1 17.3	− 0 59.6	− 0 41.6
6	− 1 12.9	− 0 55.1	− 0 37.1
12	− 1 08.5	− 0 50.6	− 0 32.5
18	− 1 04.1	− 0 46.1	− 0 27.9
24	− 0 59.6	− 0 41.6	− 0 23.3

Lat. N °	Sunrise h m	Twlt. begins h m	Moonrise 28 h m	29 h m	30 h m	31 h m
72	3 46	////	□	□	□	□
70	4 02	////	□	□	□	21 25
68	4 15	////	18 59	19 16	20 30	22 26
66	4 25	////	19 40	20 16	21 24	23 00
64	4 34	////	20 09	20 50	21 56	23 25
62	4 41	0 45	20 31	21 15	22 20	23 44
60	4 48	1 35	20 48	21 35	22 39	24 00
58	4 53	2 03	21 03	21 51	22 55	24 13
56	4 58	2 24	21 16	22 05	23 09	24 25
54	5 03	2 41	21 27	22 17	23 20	24 35
52	5 07	2 55	21 37	22 28	23 31	24 44
50	5 10	3 07	21 46	22 37	23 40	24 52
45	5 18	3 30	22 05	22 57	23 59	25 09
40	5 25	3 47	22 20	23 13	24 15	0 15
35	5 30	4 01	22 33	23 27	24 28	0 28
30	5 35	4 12	22 44	23 39	24 40	0 40
20	5 44	4 28	23 04	24 00	0 00	1 00
10	5 51	4 40	23 21	24 17	0 17	1 17
0	5 58	4 48	23 37	24 34	0 34	1 33
10	6 04	4 55	23 53	24 51	0 51	1 49
20	6 11	4 58	24 10	0 10	1 09	2 07
30	6 19	5 00	24 29	0 29	1 29	2 27
35	6 23	5 01	24 41	0 41	1 41	2 38
40	6 28	5 00	24 54	0 54	1 55	2 51
45	6 34	4 58	0 05	1 10	2 12	3 07
50	6 41	4 55	0 22	1 30	2 32	3 26
52	6 44	4 53	0 30	1 39	2 42	3 36
54	6 47	4 52	0 39	1 49	2 52	3 46
56	6 51	4 50	0 49	2 01	3 05	3 57
58	6 55	4 47	1 01	2 15	3 19	4 11
60	7 00	4 44	1 14	2 30	3 36	4 26

Lat. N °	Sunset h m	Twlt. ends h m	Moonset 28 h m	29 h m	30 h m	31 h m
72	20 12	////	□	□	□	□
70	19 57	////	□	□	□	19 20
68	19 44	////	15 39	17 20	18 09	18 18
66	19 34	////	14 57	16 20	17 15	17 44
64	19 26	////	14 29	15 46	16 43	17 18
62	19 19	23 02	14 08	15 21	16 18	16 58
60	19 13	22 19	13 50	15 01	15 59	16 42
58	19 07	21 52	13 36	14 45	15 43	16 28
56	19 02	21 32	13 23	14 31	15 30	16 16
54	18 58	21 16	13 12	14 19	15 18	16 06
52	18 54	21 03	13 03	14 09	15 07	15 56
50	18 50	20 51	12 54	13 59	14 58	15 48
45	18 43	20 29	12 36	13 40	14 38	15 30
40	18 36	20 12	12 21	13 23	14 22	15 16
35	18 31	20 00	12 09	13 10	14 08	15 03
30	18 26	19 49	11 58	12 58	13 57	14 52
20	18 18	19 33	11 39	12 38	13 36	14 33
10	18 11	19 22	11 23	12 20	13 19	14 17
0	18 04	19 14	11 08	12 04	13 02	14 02
10	17 58	19 08	10 52	11 47	12 46	13 46
20	17 51	19 05	10 36	11 30	12 28	13 30
30	17 43	19 03	10 18	11 09	12 07	13 11
35	17 39	19 03	10 07	10 58	11 55	12 59
40	17 34	19 04	9 54	10 44	11 41	12 46
45	17 29	19 07	9 40	10 28	11 25	12 31
50	17 22	19 10	9 22	10 08	11 05	12 12
52	17 19	19 11	9 14	9 59	10 55	12 04
54	17 15	19 13	9 04	9 48	10 44	11 54
56	17 12	19 16	8 54	9 36	10 32	11 42
58	17 08	19 19	8 42	9 22	10 18	11 29
60	17 03	19 22	8 28	9 06	10 01	11 14

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
28	4 55	8 55	1 15	12 23	17 12
29	5 50	8 55	1 10	12 20	17 09
30	6 48	8 55	1 05	12 17	17 05
31	7 48	8 55	1 00	12 13	17 01

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.2	0.2	0.4
30	0.2	0.2	0.3
45	0.2	0.1	0.2
60	0.2	0.1	0.1
75	0.2	0.0	0.1
90			

Moon's Lower Limb **Add**

Alt.	28	29	30
°	′	′	′
0	16.7	17.6	18.5
4	16.7	17.6	18.5
8	16.7	17.6	18.4
12	16.7	17.5	18.4
16	16.7	17.5	18.4
20	16.6	17.5	18.3
24	16.6	17.4	18.2
28	16.6	17.4	18.2
32	16.5	17.3	18.1
36	16.5	17.2	18.0
40	16.5	17.2	17.9
44	16.4	17.1	17.8
48	16.4	17.0	17.7
52	16.3	16.9	17.5
56	16.3	16.8	17.4
60	16.2	16.7	17.3
64	16.2	16.6	17.1
68	16.1	16.5	17.0
72	16.0	16.4	16.8
76	16.0	16.3	16.7
80	15.9	16.2	16.5
84	15.9	16.1	16.3
88	15.8	16.0	16.2
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	28	29	30
°	′	′	′
0	14.9	14.4	13.9
4	14.9	14.4	13.9
8	14.9	14.4	13.9
12	14.9	14.4	13.9
16	14.9	14.5	14.0
20	15.0	14.5	14.0
24	15.0	14.5	14.1
28	15.0	14.6	14.2
32	15.0	14.7	14.3
36	15.1	14.7	14.4
40	15.1	14.8	14.5
44	15.2	14.9	14.6
48	15.2	15.0	14.7
52	15.3	15.0	14.8
56	15.3	15.1	15.0
60	15.4	15.2	15.1
64	15.4	15.3	15.2
68	15.5	15.4	15.4
72	15.5	15.5	15.5
76	15.6	15.7	15.7
80	15.7	15.8	15.9
84	15.7	15.9	16.0
88	15.8	16.0	16.1
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −4.0 GHA	VENUS −4.0 Dec.	MARS −2.6 GHA	MARS −2.6 Dec.	JUPITER −1.2 GHA	JUPITER −1.2 Dec.	SATURN 0.8 GHA	SATURN 0.8 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
31 0	339 08.7	226 09.8	+18 50.9	344 53.8	− 9 15.8	176 14.2	+ 8 18.7	104 02.1	−17 37.9	247 46.6	53	+21 04.1	− 32
1	354 11.2	241 09.8	50.7	359 56.8	16.0	191 16.2	18.5	119 04.4	37.9	262 10.9	52	21 00.9	− 34
2	9 13.6	256 09.7	50.6	14 59.8	16.2	206 18.1	18.3	134 06.8	38.0	276 35.1	52	20 57.5	− 34
3	24 16.1	271 09.6	·· 50.4	30 02.8	·· 16.4	221 20.1	·· 18.1	149 09.1	·· 38.0	290 59.3	53	·20 54.1	− 36
4	39 18.6	286 09.6	50.2	45 05.9	16.6	236 22.0	17.9	164 11.4	38.0	305 23.6	52	20 50.5	− 38
5	54 21.0	301 09.5	50.1	60 08.9	16.8	251 24.0	17.7	179 13.8	38.1	319 47.8	52	20 46.7	− 39
6	69 23.5	316 09.4	+18 49.9	75 11.9	− 9 17.1	266 26.0	+ 8 17.5	194 16.1	−17 38.1	334 12.0	52	+20 42.8	− 41
7	84 26.0	331 09.3	49.8	90 15.0	17.3	281 27.9	17.3	209 18.5	38.1	348 36.2	52	20 38.7	− 42
8	99 28.4	346 09.3	49.6	105 18.0	17.5	296 29.9	17.1	224 20.8	38.2	3 00.4	52	20 34.5	− 43
9	114 30.9	1 09.2	·· 49.5	120 21.0	·· 17.7	311 31.8	·· 16.9	239 23.1	·· 38.2	17 24.6	53	·20 30.2	− 45
10	129 33.4	16 09.1	49.3	135 24.1	17.9	326 33.8	16.7	254 25.5	38.3	31 48.9	52	20 25.7	− 46
11	144 35.8	31 09.0	49.1	150 27.1	18.1	341 35.7	16.5	269 27.8	38.3	46 13.1	52	20 21.1	− 48
12	159 38.3	46 09.0	+18 49.0	165 30.1	− 9 18.3	356 37.7	+ 8 16.3	284 30.2	−17 38.3	60 37.3	53	+20 16.3	− 49
13	174 40.8	61 08.9	48.8	180 33.2	18.5	11 39.7	16.1	299 32.5	38.4	75 01.6	52	20 11.4	− 51
14	189 43.2	76 08.8	48.6	195 36.2	18.7	26 41.6	15.9	314 34.8	38.4	89 25.8	53	20 06.3	− 51
15	204 45.7	91 08.7	·· 48.5	210 39.2	·· 19.0	41 43.6	·· 15.7	329 37.2	·· 38.4	103 50.1	52	·20 01.2	− 54
16	219 48.1	106 08.6	48.3	225 42.3	19.2	56 45.5	15.4	344 39.5	38.5	118 14.3	53	19 55.8	− 55
17	234 50.6	121 08.6	48.1	240 45.3	19.4	71 47.5	15.2	359 41.8	38.5	132 38.6	53	19 50.3	− 56
18	249 53.1	136 08.5	+18 48.0	255 48.4	− 9 19.6	86 49.4	+ 8 15.0	14 44.2	−17 38.6	147 02.9	53	+19 44.7	− 57
19	264 55.5	151 08.4	47.8	270 51.4	19.8	101 51.4	14.8	29 46.5	38.6	161 27.2	53	19 39.0	− 59
20	279 58.0	166 08.3	47.6	285 54.4	20.0	116 53.4	14.6	44 48.9	38.6	175 51.5	54	19 33.1	− 60
21	295 00.5	181 08.2	·· 47.5	300 57.5	·· 20.2	131 55.3	·· 14.4	59 51.2	·· 38.7	190 15.9	53	·19 27.1	− 62
22	310 02.9	196 08.1	47.3	316 00.5	20.4	146 57.3	14.2	74 53.5	38.7	204 40.2	54	19 20.9	− 63
23	325 05.4	211 08.1	47.1	331 03.6	20.7	161 59.2	14.0	89 55.9	38.7	219 04.6	54	19 14.6	− 65
1 0	340 07.9	226 08.0	+18 47.0	346 06.6	− 9 20.9	177 01.2	+ 8 13.8	104 58.2	−17 38.8	233 29.0	54	+19 08.1	− 65
1	355 10.3	241 07.9	46.8	1 09.7	21.1	192 03.1	13.6	120 00.6	38.8	247 53.4	55	19 01.6	− 67
2	10 12.8	256 07.8	46.6	16 12.7	21.3	207 05.1	13.4	135 02.9	38.9	262 17.9	54	18 54.9	− 69
3	25 15.3	271 07.7	·· 46.4	31 15.8	·· 21.5	222 07.1	·· 13.2	150 05.2	·· 38.9	276 42.3	55	·18 48.0	− 70
4	40 17.7	286 07.6	46.3	46 18.8	21.7	237 09.0	13.0	165 07.6	38.9	291 06.8	55	18 41.0	− 71
5	55 20.2	301 07.5	46.1	61 21.9	21.9	252 11.0	12.8	180 09.9	39.0	305 31.3	56	18 33.9	− 72
6	70 22.6	316 07.4	+18 45.9	76 24.9	− 9 22.1	267 12.9	+ 8 12.6	195 12.2	−17 39.0	319 55.9	55	+18 26.7	− 74
7	85 25.1	331 07.3	45.7	91 28.0	22.3	282 14.9	12.4	210 14.6	39.1	334 20.4	56	18 19.3	− 75
8	100 27.6	346 07.3	45.6	106 31.0	22.6	297 16.8	12.2	225 16.9	39.1	348 45.0	56	18 11.8	− 76
9	115 30.0	1 07.2	·· 45.4	121 34.1	·· 22.8	312 18.8	·· 12.0	240 19.2	·· 39.1	3 09.6	57	·18 04.2	− 78
10	130 32.5	16 07.1	45.2	136 37.1	23.0	327 20.8	11.8	255 21.6	39.2	17 34.3	57	17 56.4	− 78
11	145 35.0	31 07.0	45.0	151 40.2	23.2	342 22.7	11.6	270 23.9	39.2	31 59.0	57	17 48.6	− 80
12	160 37.4	46 06.9	+18 44.9	166 43.2	− 9 23.4	357 24.7	+ 8 11.4	285 26.3	−17 39.2	46 23.7	57	+17 40.6	− 82
13	175 39.9	61 06.8	44.7	181 46.3	23.6	12 26.6	11.1	300 28.6	39.3	60 48.4	58	17 32.4	− 82
14	190 42.4	76 06.7	44.5	196 49.3	23.8	27 28.6	10.9	315 30.9	39.3	75 13.2	58	17 24.2	− 84
15	205 44.8	91 06.6	·· 44.3	211 52.4	·· 24.0	42 30.5	·· 10.7	330 33.3	·· 39.4	89 38.0	59	·17 15.8	− 85
16	220 47.3	106 06.5	44.1	226 55.4	24.3	57 32.5	10.5	345 35.6	39.4	104 02.9	59	17 07.3	− 86
17	235 49.7	121 06.4	43.9	241 58.5	24.5	72 34.5	10.3	0 37.9	39.4	118 27.8	59	16 58.7	− 88
18	250 52.2	136 06.3	+18 43.8	257 01.6	− 9 24.7	87 36.4	+ 8 10.1	15 40.3	−17 39.5	132 52.7	59	+16 49.9	− 88
19	265 54.7	151 06.2	43.6	272 04.6	24.9	102 38.4	09.9	30 42.6	39.5	147 17.6	60	16 41.1	− 90
20	280 57.1	166 06.1	43.4	287 07.7	25.1	117 40.3	09.7	45 44.9	39.6	161 42.6	61	16 32.1	− 91
21	295 59.6	181 06.0	·· 43.2	302 10.7	·· 25.3	132 42.3	·· 09.5	60 47.3	·· 39.6	176 07.7	60	·16 23.0	− 92
22	311 02.1	196 05.9	43.0	317 13.8	25.5	147 44.2	09.3	75 49.6	39.6	190 32.7	62	16 13.8	− 93
23	326 04.5	211 05.8	42.8	332 16.9	25.7	162 46.2	09.1	90 51.9	39.7	204 57.9	61	16 04.5	− 94
2 0	341 07.0	226 05.7	+18 42.6	347 19.9	− 9 25.9	177 48.2	+ 8 08.9	105 54.3	−17 39.7	219 23.0	62	+15 55.1	− 96
1	356 09.5	241 05.6	42.4	2 23.0	26.2	192 50.1	08.7	120 56.6	39.7	233 48.2	62	15 45.5	− 96
2	11 11.9	256 05.5	42.2	17 26.1	26.4	207 52.1	08.5	135 58.9	39.8	248 13.4	63	15 35.9	− 98
3	26 14.4	271 05.4	·· 42.1	32 29.1	·· 26.6	222 54.0	·· 08.3	151 01.3	·· 39.8	262 38.7	63	·15 26.1	− 98
4	41 16.9	286 05.3	41.9	47 32.2	26.8	237 56.0	08.1	166 03.6	39.9	277 04.0	64	15 16.3	−100
5	56 19.3	301 05.2	41.7	62 35.3	27.0	252 58.0	07.9	181 05.9	39.9	291 29.4	64	15 06.3	−101
6	71 21.8	316 05.1	+18 41.5	77 38.3	− 9 27.2	267 59.9	+ 8 07.7	196 08.3	−17 39.9	305 54.8	64	+14 56.2	−102
7	86 24.2	331 04.9	41.3	92 41.4	27.4	283 01.9	07.5	211 10.6	40.0	320 20.2	65	14 46.0	−103
8	101 26.7	346 04.8	41.1	107 44.5	27.6	298 03.8	07.3	226 12.9	40.0	334 45.7	66	14 35.7	−103
9	116 29.2	1 04.7	·· 40.9	122 47.6	·· 27.8	313 05.8	·· 07.0	241 15.3	·· 40.1	349 11.3	65	·14 25.4	−105
10	131 31.6	16 04.6	40.7	137 50.6	28.1	328 07.7	06.8	256 17.6	40.1	3 36.8	67	14 14.9	−106
11	146 34.1	31 04.5	40.5	152 53.7	28.3	343 09.7	06.6	271 19.9	40.1	18 02.5	66	14 04.3	−107
12	161 36.6	46 04.4	+18 40.3	167 56.8	− 9 28.5	358 11.7	+ 8 06.4	286 22.3	−17 40.2	32 28.1	68	+13 53.6	−107
13	176 39.0	61 04.3	40.1	182 59.8	28.7	13 13.6	06.2	301 24.6	40.2	46 53.9	67	13 42.9	−109
14	191 41.5	76 04.2	39.9	198 02.9	28.9	28 15.6	06.0	316 26.9	40.3	61 19.6	68	13 32.0	−109
15	206 44.0	91 04.1	·· 39.7	213 06.0	·· 29.1	43 17.5	·· 05.8	331 29.3	·· 40.3	75 45.4	69	·13 21.1	−111
16	221 46.4	106 03.9	39.5	228 09.1	29.3	58 19.5	05.6	346 31.6	40.3	90 11.3	69	13 10.0	−111
17	236 48.9	121 03.8	39.3	243 12.1	29.5	73 21.4	05.4	1 33.9	40.4	104 37.2	69	12 58.9	−112
18	251 51.4	136 03.7	+18 39.1	258 15.2	− 9 29.7	88 23.4	+ 8 05.2	16 36.2	−17 40.4	119 03.1	70	+12 47.7	−113
19	266 53.8	151 03.6	38.9	273 18.3	30.0	103 25.4	05.0	31 38.6	40.5	133 29.1	70	12 36.4	−114
20	281 56.3	166 03.5	38.7	288 21.4	30.2	118 27.3	04.8	46 40.9	40.5	147 55.1	71	12 25.0	−115
21	296 58.7	181 03.4	·· 38.5	303 24.4	·· 30.4	133 29.3	·· 04.6	61 43.2	·· 40.5	162 21.2	71	·12 13.5	−116
22	312 01.2	196 03.2	38.3	318 27.5	30.6	148 31.2	04.4	76 45.6	40.6	176 47.3	72	12 01.9	−116
23	327 03.7	211 03.1	38.1	333 30.6	30.8	163 33.2	04.2	91 47.9	40.6	191 13.5	72	11 50.3	−117
24	342 06.1	226 03.0	+18 37.8	348 33.7	− 9 31.0	178 35.1	+ 8 04.0	106 50.2	−17 40.6	205 39.7	73	+11 38.6	−118
code	−	− 1	− 2	+ 31	− 2	+ 19	− 3	+ 23	− 1				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
31 0	179 54.3	+ 8 44.2
1	194 54.5	43.3
2	209 54.7	42.4
3	224 54.9	41.5
4	239 55.0	40.6
5	254 55.2	39.7
6	269 55.4	+ 8 38.8
7	284 55.6	37.9
8	299 55.8	37.0
9	314 56.0	36.1
10	329 56.2	35.2
11	344 56.4	34.3
12	359 56.6	+ 8 33.4
13	14 56.8	32.5
14	29 57.0	31.6
15	44 57.2	30.7
16	59 57.4	29.8
17	74 57.6	28.9
18	89 57.8	+ 8 28.0
19	104 58.0	27.1
20	119 58.1	26.2
21	134 58.3	25.3
22	149 58.5	24.4
23	164 58.7	23.5
1 0	179 58.9	+ 8 22.6
1	194 59.1	21.7
2	209 59.3	20.8
3	224 59.5	19.9
4	239 59.7	19.0
5	254 59.9	18.0
6	270 00.1	+ 8 17.1
7	285 00.3	16.2
8	300 00.5	15.3
9	315 00.7	14.4
10	330 00.9	13.5
11	345 01.1	12.6
12	0 01.3	+ 8 11.7
13	15 01.5	10.8
14	30 01.7	09.9
15	45 01.9	09.0
16	60 02.1	08.1
17	75 02.3	07.1
18	90 02.5	+ 8 06.2
19	105 02.7	05.3
20	120 02.9	04.4
21	135 03.1	03.5
22	150 03.3	02.6
23	165 03.5	01.7
2 0	180 03.7	+ 8 00.8
1	195 03.9	7 59.9
2	210 04.1	58.9
3	225 04.3	58.0
4	240 04.5	57.1
5	255 04.7	56.2
6	270 04.9	+ 7 55.3
7	285 05.1	54.4
8	300 05.2	53.5
9	315 05.4	52.6
10	330 05.6	51.6
11	345 05.8	50.7
12	0 06.0	+ 7 49.8
13	15 06.2	48.9
14	30 06.4	48.0
15	45 06.6	47.1
16	60 06.8	46.2
17	75 07.0	45.2
18	90 07.2	+ 7 44.3
19	105 07.4	43.4
20	120 07.6	42.5
21	135 07.9	41.6
22	150 08.1	40.7
23	165 08.3	39.8
24	180 08.5	+ 7 38.8
code	—	− 9

No.	Name	STARS SHA	STARS Dec.
		° ′	° ′
7	Acamar	315 50.4	−40 28.3
5	Achernar	335 58.0	−57 27.0
30	Acrux	173 57.6	−62 51.7
19	Adhara	255 46.2	−28 54.6
10	Aldebaran	291 38.3	+16 25.4
32	Alioth	166 58.4	+56 11.8
34	Alkaid	153 32.7	+49 31.9
55	Al Na'ir	28 36.6	−47 10.1
15	Alnilam	276 29.6	− 1 13.6
25	Alphard	218 38.2	− 8 28.2
41	Alphecca	126 47.1	+26 51.8
1	Alpheratz	358 27.3	+28 51.2
51	Altair	62 49.5	+ 8 45.4
2	Ankaa	353 57.2	−42 32.2
42	Antares	113 18.5	−26 20.3
37	Arcturus	146 34.7	+19 24.6
43	Atria	108 58.5	−68 57.3
22	Avior	234 36.0	−59 22.1
13	Bellatrix	279 17.7	+ 6 18.8
16	Betelg'se	271 47.5	+ 7 24.1
17	Canopus	264 15.3	−52 40.0
12	Capella	281 37.5	+45 57.2
53	Deneb	50 00.1	+45 07.8
28	Denebola	183 17.3	+14 48.9
4	Diphda	349 38.3	−18 13.2
27	Dubhe	194 44.4	+61 59.1
14	Elnath	279 06.5	+28 34.3
47	Eltanin	91 05.7	+51 30.0
54	Enif	34 28.6	+ 9 40.8
56	Fomalhaut	16 10.5	−29 50.9
31	Gacrux	172 48.9	−56 52.4
29	Gienah	176 36.4	−17 18.1
35	Hadar	149 48.8	−60 10.1
6	Hamal	328 48.6	+23 15.6
48	Kaus Aust.	84 40.1	−34 24.4
40	Kochab	137 18.5	+74 20.2
57	Markab	14 20.4	+14 58.5
8	Menkar	314 59.5	+ 3 55.4
36	Menkent	148 58.0	−36 09.6
24	Miapl'dus	221 49.7	−69 32.3
9	Mirfak	309 41.2	+49 42.4
50	Nunki	76 50.8	−26 21.1
52	Peacock	54 25.7	−56 52.5
21	Pollux	244 20.0	+28 07.9
20	Procyon	245 44.5	+ 5 20.3
46	R'alhague	96 45.9	+12 35.7
26	Regulus	208 29.1	+12 10.8
11	Rigel	281 53.0	− 8 14.9
38	Rigil Kent.	140 50.3	−60 39.7
44	Sabik	103 01.3	−15 40.3
3	Schedar	350 28.6	+56 18.0
45	Shaula	97 19.6	−37 04.5
18	Sirius	259 11.4	−16 39.2
33	Spica	159 16.4	−10 56.1
23	Suhail	223 24.2	−43 15.4
49	Vega	81 07.6	+38 44.9
39	Zub'g'bi	137 52.7	−15 51.8

GMT	Equation of Time (App.—Mean) 31	1	2
h	m s	m s	m s
0	− 0 23.3	− 0 04.7	+ 0 14.2
6	− 0 18.7	0 00.0	+ 0 19.0
12	− 0 14.0	+ 0 04.7	+ 0 23.8
18	− 0 09.4	+ 0 09.5	+ 0 28.6
24	− 0 04.7	+ 0 14.2	+ 0 33.4

Lat. N°	Sunrise	Twlt. begins	Moonrise 31	1	2	3
	h m	h m	h m	h m	h m	h m
72	4 01	////	▭	23 17	25 53	1 53
70	4 15	////	21 25	23 59	26 13	2 13
68	4 26	////	22 26	24 27	0 27	2 28
66	4 35	////	23 00	24 49	0 49	2 40
64	4 42	////	23 25	25 06	1 06	2 51
62	4 49	1 17	23 44	25 20	1 20	2 59
60	4 55	1 52	24 00	0 00	1 31	3 07
58	5 00	2 16	24 13	0 13	1 42	3 13
56	5 04	2 35	24 25	0 25	1 50	3 19
54	5 08	2 50	24 35	0 35	1 58	3 24
52	5 12	3 03	24 44	0 44	2 05	3 29
50	5 15	3 13	24 52	0 52	2 11	3 33
45	5 22	3 35	25 09	1 09	2 25	3 42
40	5 28	3 51	0 15	1 23	2 36	3 50
35	5 33	4 04	0 28	1 35	2 45	3 56
30	5 37	4 14	0 40	1 45	2 53	4 02
20	5 44	4 29	1 00	2 03	3 08	4 12
10	5 51	4 40	1 17	2 18	3 20	4 20
0	5 57	4 48	1 33	2 33	3 31	4 28
10	6 02	4 53	1 49	2 47	3 43	4 36
20	6 08	4 56	2 07	3 03	3 55	4 45
30	6 15	4 56	2 27	3 20	4 09	4 54
35	6 19	4 56	2 38	3 30	4 17	5 00
40	6 23	4 55	2 51	3 42	4 26	5 06
45	6 28	4 52	3 07	3 56	4 37	5 13
50	6 34	4 48	3 26	4 12	4 50	5 22
52	6 37	4 47	3 36	4 20	4 56	5 26
54	6 40	4 44	3 46	4 29	5 03	5 30
56	6 43	4 42	3 57	4 38	5 10	5 35
58	6 47	4 39	4 11	4 49	5 18	5 41
60	6 51	4 35	4 26	5 02	5 28	5 47

Lat. N°	Sunset	Twlt. ends	Moonset 31	1	2	3
	h m	h m	h m	h m	h m	h m
72	19 55	////	▭	19 33	18 57	18 36
70	19 42	////	19 20	18 49	18 35	18 25
68	19 32	////	18 18	18 20	18 18	18 16
66	19 23	////	17 44	17 57	18 04	18 09
64	19 15	23 50	17 18	17 40	17 53	18 02
62	19 09	22 33	16 58	17 25	17 43	17 57
60	19 04	22 01	16 42	17 12	17 35	17 52
58	18 59	21 38	16 28	17 02	17 27	17 48
56	18 54	21 20	16 16	16 52	17 20	17 44
54	18 51	21 06	16 06	16 44	17 14	17 40
52	18 47	20 53	15 56	16 36	17 09	17 37
50	18 44	20 43	15 48	16 30	17 04	17 34
45	18 37	20 22	15 30	16 15	16 54	17 28
40	18 32	20 07	15 16	16 03	16 45	17 23
35	18 27	19 55	15 03	15 53	16 37	17 18
30	18 23	19 45	14 52	15 44	16 30	17 14
20	18 15	19 30	14 33	15 28	16 19	17 07
10	18 09	19 20	14 17	15 14	16 08	17 00
0	18 03	19 12	14 02	15 01	15 59	16 54
10	17 58	19 08	13 46	14 48	15 49	16 48
20	17 52	19 05	13 30	14 34	15 38	16 42
30	17 45	19 05	13 11	14 17	15 26	16 34
35	17 41	19 05	12 59	14 08	15 19	16 30
40	17 37	19 07	12 46	13 57	15 11	16 25
45	17 32	19 10	12 31	13 44	15 01	16 19
50	17 26	19 14	12 12	13 29	14 50	16 12
52	17 24	19 16	12 04	13 21	14 44	16 09
54	17 21	19 19	11 54	13 13	14 38	16 05
56	17 18	19 22	11 42	13 04	14 32	16 01
58	17 14	19 25	11 29	12 53	14 24	15 57
60	17 10	19 29	11 14	12 41	14 16	15 52

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
31	7 48	8 55	1 00	12 13	17 01
1	8 47	8 56	0 55	12 10	16 58
2	9 45	8 56	0 51	12 07	16 54
3	10 41	8 56	0 46	12 04	16 50

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.2	0.2	0.4
30	0.2	0.2	0.3
45	0.2	0.1	0.2
60	0.2	0.1	0.1
75	0.2	0.0	0.1
90			

Moon's Lower Limb **Add**

Alt.	31	1	2
°	′	′	′
0	19.2	19.9	20.3
4	19.2	19.9	20.2
8	19.2	19.8	20.2
12	19.2	19.8	20.1
16	19.1	19.7	20.1
20	19.0	19.6	20.0
24	18.9	19.5	19.9
28	18.9	19.4	19.8
32	18.7	19.3	19.6
36	18.6	19.2	19.5
40	18.5	19.0	19.3
44	18.4	18.8	19.1
48	18.2	18.7	18.9
52	18.0	18.5	18.7
56	17.9	18.3	18.5
60	17.7	18.1	18.3
64	17.5	17.9	18.1
68	17.3	17.6	17.8
72	17.1	17.4	17.6
76	16.9	17.2	17.3
80	16.7	17.0	17.1
84	16.5	16.7	16.8
88	16.4	16.5	16.6
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	31	1	2
°	′	′	′
0	13.4	13.1	12.9
4	13.5	13.1	12.9
8	13.5	13.1	12.9
12	13.5	13.2	13.0
16	13.6	13.2	13.0
20	13.7	13.3	13.1
24	13.7	13.4	13.2
28	13.8	13.5	13.4
32	13.9	13.7	13.5
36	14.1	13.8	13.6
40	14.2	13.9	13.8
44	14.3	14.1	14.0
48	14.5	14.3	14.2
52	14.6	14.5	14.4
56	14.8	14.7	14.6
60	15.0	14.9	14.8
64	15.2	15.1	15.1
68	15.3	15.3	15.3
72	15.5	15.5	15.5
76	15.7	15.8	15.8
80	15.9	16.0	16.0
84	16.1	16.2	16.3
88	16.3	16.4	16.5

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.9 GHA	Dec.	MARS −2.6 GHA	Dec.	JUPITER −1.2 GHA	Dec.	SATURN 0.8 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
3 00	342 06.1	226 03.0	+18 37.8	348 33.7	− 9 31.0	178 35.1	+ 8 04.0	106 50.2	−17 40.6	205 39.7	73	+11 38.6	−118
01	357 08.6	241 02.9	37.6	3 36.8	31.2	193 37.1	03.8	121 52.6	40.7	220 06.0	73	11 26.8	−119
2	12 11.1	256 02.8	37.4	18 39.9	31.4	208 39.1	03.6	136 54.9	40.7	234 32.3	74	11 14.9	−119
3	27 13.5	271 02.6	·· 37.2	33 42.9	·· 31.6	223 41.0	·· 03.4	151 57.2	·· 40.8	248 58.7	74	·11 03.0	−120
4	42 16.0	286 02.5	37.0	48 46.0	31.8	238 43.0	03.2	166 59.6	40.8	263 25.1	75	10 51.0	−121
5	57 18.5	301 02.4	36.8	63 49.1	32.1	253 44.9	02.9	182 01.9	40.8	277 51.6	75	10 38.9	−121
6	72 20.9	316 02.3	+18 36.6	78 52.2	− 9 32.3	268 46.9	+ 8 02.7	197 04.2	−17 40.9	292 18.1	75	+10 26.8	−122
7	87 23.4	331 02.1	36.4	93 55.3	32.5	283 48.8	02.5	212 06.5	40.9	306 44.6	76	10 14.6	−123
8	102 25.8	346 02.0	36.2	108 58.4	32.7	298 50.8	02.3	227 08.9	41.0	321 11.2	76	10 02.3	−123
9	117 28.3	1 01.9	·· 35.9	124 01.5	·· 32.9	313 52.8	·· 02.1	242 11.2	·· 41.0	335 37.8	77	· 9 50.0	−125
10	132 30.8	16 01.8	35.7	139 04.5	33.1	328 54.7	01.9	257 13.5	41.0	350 04.5	77	9 37.5	−124
11	147 33.2	31 01.6	35.5	154 07.6	33.3	343 56.7	01.7	272 15.9	41.1	4 31.2	78	9 25.1	−125
12	162 35.7	46 01.5	+18 35.3	169 10.7	− 9 33.5	358 58.6	+ 8 01.5	287 18.2	−17 41.1	18 58.0	78	+ 9 12.6	−126
13	177 38.2	61 01.4	35.1	184 13.8	33.7	14 00.6	01.3	302 20.5	41.2	33 24.8	79	9 00.0	−127
14	192 40.6	76 01.3	34.8	199 16.9	33.9	29 02.5	01.1	317 22.8	41.2	47 51.7	79	8 47.3	−126
15	207 43.1	91 01.1	·· 34.6	214 20.0	·· 34.2	44 04.5	·· 00.9	332 25.2	·· 41.2	62 18.6	80	· 8 34.7	−128
16	222 45.6	106 01.0	34.4	229 23.1	34.4	59 06.5	00.7	347 27.5	41.3	76 45.6	80	8 21.9	−128
17	237 48.0	121 00.9	34.2	244 26.2	34.6	74 08.4	00.5	2 29.8	41.3	91 12.6	80	8 09.1	−128
18	252 50.5	136 00.7	+18 34.0	259 29.3	− 9 34.8	89 10.4	+ 8 00.3	17 32.1	−17 41.4	105 39.6	81	+ 7 56.3	−129
19	267 53.0	151 00.6	33.7	274 32.4	35.0	104 12.3	8 00.1	32 34.5	41.4	120 06.7	81	7 43.4	−129
20	282 55.4	166 00.5	33.5	289 35.5	35.2	119 14.3	7 59.9	47 36.8	41.4	134 33.8	82	7 30.5	−130
21	297 57.9	181 00.3	·· 33.3	304 38.5	·· 35.4	134 16.3	·· 59.7	62 39.1	·· 41.5	149 01.0	82	· 7 17.5	−130
22	313 00.3	196 00.2	33.1	319 41.6	35.6	149 18.2	59.5	77 41.5	41.5	163 28.2	82	7 04.5	−131
23	328 02.8	211 00.1	32.8	334 44.7	35.8	164 20.2	59.2	92 43.8	41.6	177 55.4	83	6 51.4	−131
4 00	343 05.3	225 59.9	+18 32.6	349 47.8	− 9 36.0	179 22.1	+ 7 59.0	107 46.1	−17 41.6	192 22.7	84	+ 6 38.3	−131
01	358 07.7	240 59.8	32.4	4 50.9	36.2	194 24.1	58.8	122 48.4	41.6	206 50.1	84	6 25.2	−132
2	13 10.2	255 59.7	32.2	19 54.0	36.4	209 26.0	58.6	137 50.8	41.7	221 17.5	84	6 12.0	−132
3	28 12.7	270 59.5	·· 31.9	34 57.1	·· 36.7	224 28.0	·· 58.4	152 53.1	·· 41.7	235 44.9	84	· 5 58.8	−132
4	43 15.1	285 59.4	31.7	50 00.2	36.9	239 30.0	58.2	167 55.4	41.8	250 12.3	85	5 45.6	−133
5	58 17.6	300 59.3	31.5	65 03.3	37.1	254 31.9	58.0	182 57.7	41.8	264 39.8	86	5 32.3	−133
6	73 20.1	315 59.1	+18 31.2	80 06.4	− 9 37.3	269 33.9	+ 7 57.8	198 00.1	−17 41.8	279 07.4	85	+ 5 19.0	−133
7	88 22.5	330 59.0	31.0	95 09.5	37.5	284 35.8	57.6	213 02.4	41.9	293 34.9	86	5 05.7	−134
8	103 25.0	345 58.8	30.8	110 12.6	37.7	299 37.8	57.4	228 04.7	41.9	308 02.5	87	4 52.3	−133
9	118 27.5	0 58.7	·· 30.5	125 15.7	·· 37.9	314 39.7	·· 57.2	243 07.0	·· 42.0	322 30.2	87	· 4 39.0	−134
10	133 29.9	15 58.6	30.3	140 18.8	38.1	329 41.7	57.0	258 09.4	42.0	336 57.9	87	4 25.6	−134
11	148 32.4	30 58.4	30.1	155 21.9	38.3	344 43.7	56.8	273 11.7	42.0	351 25.6	88	4 12.2	−135
12	163 34.8	45 58.3	+18 29.8	170 25.0	− 9 38.5	359 45.6	+ 7 56.6	288 14.0	−17 42.1	5 53.4	88	+ 3 58.7	−134
13	178 37.3	60 58.1	29.6	185 28.1	38.7	14 47.6	56.4	303 16.3	42.1	20 21.2	88	3 45.3	−135
14	193 39.8	75 58.0	29.3	200 31.2	38.9	29 49.5	56.2	318 18.7	42.2	34 49.0	88	3 31.8	−135
15	208 42.2	90 57.8	·· 29.1	215 34.4	·· 39.1	44 51.5	·· 56.0	333 21.0	·· 42.2	49 16.8	89	· 3 18.3	−135
16	223 44.7	105 57.7	28.9	230 37.5	39.3	59 53.4	55.8	348 23.3	42.3	63 44.7	90	3 04.8	−135
17	238 47.2	120 57.6	28.6	245 40.6	39.6	74 55.4	55.6	3 25.6	42.3	78 12.7	89	2 51.3	−135
18	253 49.6	135 57.4	+18 28.4	260 43.7	− 9 39.8	89 57.4	+ 7 55.3	18 28.0	−17 42.3	92 40.6	90	+ 2 37.8	−135
19	268 52.1	150 57.3	28.1	275 46.8	40.0	104 59.3	55.1	33 30.3	42.4	107 08.6	91	2 24.3	−135
20	283 54.6	165 57.1	27.9	290 49.9	40.2	120 01.3	54.9	48 32.6	42.4	121 36.7	90	2 10.8	−135
21	298 57.0	180 57.0	·· 27.7	305 53.0	·· 40.4	135 03.2	·· 54.7	63 34.9	·· 42.5	136 04.7	91	· 1 57.3	−136
22	313 59.5	195 56.8	27.4	320 56.1	40.6	150 05.2	54.5	78 37.3	42.5	150 32.8	92	1 43.7	−135
23	329 01.9	210 56.7	27.2	335 59.2	40.8	165 07.1	54.3	93 39.6	42.5	165 01.0	91	1 30.2	−135
5 00	344 04.4	225 56.5	+18 26.9	351 02.3	− 9 41.0	180 09.1	+ 7 54.1	108 41.9	−17 42.6	179 29.1	92	+ 1 16.7	−136
01	359 06.9	240 56.4	26.7	6 05.4	41.2	195 11.1	53.9	123 44.2	42.6	193 57.3	92	1 03.1	−135
2	14 09.3	255 56.2	26.4	21 08.5	41.4	210 13.0	53.7	138 46.5	42.7	208 25.5	92	0 49.6	−135
3	29 11.8	270 56.1	·· 26.2	36 11.7	·· 41.6	225 15.0	·· 53.5	153 48.9	·· 42.7	222 53.7	93	· 0 36.1	−135
4	44 14.3	285 55.9	25.9	51 14.8	41.8	240 16.9	53.3	168 51.2	42.7	237 22.0	93	0 22.6	−135
5	59 16.7	300 55.8	25.7	66 17.9	42.0	255 18.9	53.1	183 53.5	42.8	251 50.3	93	+ 0 09.1	−135
6	74 19.2	315 55.6	+18 25.4	81 21.0	− 9 42.2	270 20.9	+ 7 52.9	198 55.8	−17 42.8	266 18.6	94	− 0 04.4	−135
7	89 21.7	330 55.5	25.2	96 24.1	42.4	285 22.8	52.7	213 58.2	42.9	280 47.0	93	0 17.9	−135
8	104 24.1	345 55.3	24.9	111 27.2	42.6	300 24.8	52.5	229 00.5	42.9	295 15.3	94	0 31.4	−135
9	119 26.6	0 55.2	·· 24.7	126 30.3	·· 42.8	315 26.7	·· 52.3	244 02.8	·· 42.9	309 43.7	95	· 0 44.9	−134
10	134 29.1	15 55.0	24.4	141 33.4	43.0	330 28.7	52.1	259 05.1	43.0	324 12.2	94	0 58.3	−134
11	149 31.5	30 54.9	24.2	156 36.6	43.2	345 30.6	51.9	274 07.4	43.0	338 40.6	95	1 11.7	−134
12	164 34.0	45 54.7	+18 23.9	171 39.7	− 9 43.4	0 32.6	+ 7 51.6	289 09.8	−17 43.1	353 09.1	95	− 1 25.1	−134
13	179 36.4	60 54.5	23.6	186 42.8	43.6	15 34.6	51.4	304 12.1	43.1	7 37.6	95	1 38.5	−134
14	194 38.9	75 54.4	23.4	201 45.9	43.8	30 36.5	51.2	319 14.4	43.2	22 06.1	95	1 51.9	−133
15	209 41.4	90 54.2	·· 23.1	216 49.0	·· 44.1	45 38.5	·· 51.0	334 16.7	·· 43.2	36 34.6	96	· 2 05.2	−133
16	224 43.8	105 54.1	22.9	231 52.1	44.3	60 40.4	50.8	349 19.0	43.2	51 03.2	95	2 18.5	−133
17	239 46.3	120 53.9	22.6	246 55.3	44.5	75 42.4	50.6	4 21.4	43.3	65 31.7	96	2 31.8	−133
18	254 48.8	135 53.7	+18 22.3	261 58.4	− 9 44.7	90 44.3	+ 7 50.4	19 23.7	−17 43.3	80 00.3	96	− 2 45.1	−132
19	269 51.2	150 53.6	22.1	277 01.5	44.9	105 46.3	50.2	34 26.0	43.4	94 28.9	97	2 58.3	−132
20	284 53.7	165 53.4	21.8	292 04.6	45.1	120 48.3	50.0	49 28.3	43.4	108 57.6	96	3 11.5	−132
21	299 56.2	180 53.3	·· 21.6	307 07.7	·· 45.3	135 50.2	·· 49.8	64 30.6	·· 43.4	123 26.2	97	· 3 24.7	−132
22	314 58.6	195 53.1	21.3	322 10.9	45.5	150 52.2	49.6	79 33.0	43.5	137 54.9	97	3 37.9	−131
23	330 01.1	210 52.9	21.0	337 14.0	45.7	165 54.1	49.4	94 35.3	43.5	152 23.6	97	3 51.0	−130
24	345 03.6	225 52.8	+18 20.8	352 17.1	− 9 45.9	180 56.1	+ 7 49.2	109 37.6	−17 43.6	166 52.3	97	− 4 04.0	−131
code	—	− 2	− 2	+ 31	− 2	+ 20	− 2	+ 23	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
3 00	180 08.5	+ 7 38.8
01	195 08.7	37.9
02	210 08.9	37.0
03	225 09.1	36.1
04	240 09.3	35.2
05	255 09.5	34.2
06	270 09.7	+ 7 33.3
07	285 09.9	32.4
08	300 10.1	31.5
09	315 10.3	30.6
10	330 10.5	29.7
11	345 10.7	28.7
12	0 10.9	+ 7 27.8
13	15 11.1	26.9
14	30 11.3	26.0
15	45 11.5	25.1
16	60 11.7	24.1
17	75 11.9	23.2
18	90 12.1	+ 7 22.3
19	105 12.3	21.4
20	120 12.5	20.5
21	135 12.7	19.5
22	150 12.9	18.6
23	165 13.1	17.7
4 00	180 13.3	+ 7 16.8
01	195 13.5	15.9
02	210 13.7	14.9
03	225 13.9	14.0
04	240 14.1	13.1
05	255 14.3	12.2
06	270 14.5	+ 7 11.2
07	285 14.7	10.3
08	300 14.9	09.4
09	315 15.1	08.5
10	330 15.4	07.5
11	345 15.6	06.6
12	0 15.8	+ 7 05.7
13	15 16.0	04.8
14	30 16.2	03.9
15	45 16.4	02.9
16	60 16.6	02.0
17	75 16.8	01.1
18	90 17.0	+ 7 00.2
19	105 17.2	6 59.2
20	120 17.4	58.3
21	135 17.6	57.4
22	150 17.8	56.4
23	165 18.0	55.5
5 00	180 18.2	+ 6 54.6
01	195 18.4	53.7
02	210 18.6	52.7
03	225 18.9	51.8
04	240 19.1	50.9
05	255 19.3	50.0
06	270 19.5	+ 6 49.0
07	285 19.7	48.1
08	300 19.9	47.2
09	315 20.1	46.3
10	330 20.3	45.3
11	345 20.5	44.4
12	0 20.7	+ 6 43.5
13	15 20.9	42.5
14	30 21.1	41.6
15	45 21.3	40.7
16	60 21.5	39.7
17	75 21.8	38.8
18	90 22.0	+ 6 37.9
19	105 22.2	37.0
20	120 22.4	36.0
21	135 22.6	35.1
22	150 22.8	34.2
23	165 23.0	33.2
24	180 23.2	+ 6 32.3
code	—	− 9

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 50.4	− 40 28.3
5	Achernar	335 57.9	− 57 27.0
30	Acrux	173 57.6	− 62 51.7
19	Adhara	255 46.2	− 28 54.6
10	Aldebaran	291 38.2	+ 16 25.4
32	Alioth	166 58.4	+ 56 11.8
34	Alkaid	153 32.7	+ 49 31.9
55	Al Na'ir	28 36.6	− 47 10.1
15	Alnilam	276 29.6	− 1 13.6
25	Alphard	218 38.2	− 8 28.2
41	Alphecca	126 47.1	+ 26 51.8
1	Alpheratz	358 27.2	+ 28 51.2
51	Altair	62 49.5	+ 8 45.4
2	Ankaa	353 57.2	− 42 32.2
42	Antares	113 18.5	− 26 20.3
37	Arcturus	146 34.7	+ 19 24.6
43	Atria	108 58.6	− 68 57.3
22	Avior	234 36.0	− 59 22.1
13	Bellatrix	279 17.7	+ 6 18.8
16	Betelg'se	271 47.5	+ 7 24.1
17	Canopus	264 15.3	− 52 40.0
12	Capella	281 37.4	+ 45 57.2
53	Deneb	50 00.1	+ 45 07.8
28	Denebola	183 17.3	+ 14 48.9
4	Diphda	349 38.3	− 18 13.2
27	Dubhe	194 44.4	+ 61 59.1
14	Elnath	279 06.5	+ 28 34.3
47	Eltanin	91 05.8	+ 51 30.0
54	Enif	34 28.6	+ 9 40.8
56	Fomalhaut	16 10.5	− 29 50.9
31	Gacrux	172 48.9	− 56 52.4
29	Gienah	176 36.4	− 17 18.1
35	Hadar	149 48.8	− 60 10.1
6	Hamal	328 48.6	+ 23 15.6
48	Kaus Aust.	84 40.1	− 34 24.4
40	Kochab	137 18.6	+ 74 20.2
57	Markab	14 20.4	+ 14 58.5
8	Menkar	314 59.4	+ 3 55.4
36	Menkent	148 58.1	− 36 09.6
24	Miapl'dus	221 49.6	− 69 32.3
9	Mirfak	309 41.2	+ 49 42.4
50	Nunki	76 50.8	− 26 21.1
52	Peacock	54 25.7	− 56 52.5
21	Pollux	244 20.0	+ 28 07.9
20	Procyon	245 44.5	+ 5 20.3
46	R'alhague	96 45.9	+ 12 35.7
26	Regulus	208 29.1	+ 12 10.8
11	Rigel	281 53.0	− 8 14.9
38	Rigil Kent.	140 50.3	− 60 39.7
44	Sabik	103 01.3	− 15 40.3
3	Schedar	350 28.6	+ 56 18.0
45	Shaula	97 19.6	− 37 04.5
18	Sirius	259 11.4	− 16 39.2
33	Spica	159 16.4	− 10 56.1
23	Suhail	223 24.2	− 43 15.3
49	Vega	81 07.6	+ 38 44.9
39	Zub'g'bi	137 52.7	− 15 51.8

GMT	Equation of Time (App.− Mean) 3	4	5
h	m s	m s	m s
0	+ 0 33.4	+ 0 52.8	+ 1 12.5
6	+ 0 38.2	+ 0 57.7	+ 1 17.5
12	+ 0 43.1	+ 1 02.6	+ 1 22.4
18	+ 0 48.0	+ 1 07.6	+ 1 27.4
24	+ 0 52.8	+ 1 12.5	+ 1 32.4

Lat. N °	Sunrise h m	Twlt. begins h m
72	4 16	////
70	4 27	////
68	4 37	////
66	4 45	////
64	4 51	0 51
62	4 57	1 39
60	5 02	2 07
58	5 06	2 28
56	5 10	2 45
54	5 13	2 59
52	5 16	3 10
50	5 19	3 20
45	5 25	3 40
40	5 30	3 54
35	5 35	4 07
30	5 38	4 16
20	5 45	4 30
10	5 51	4 40
0	5 56	4 47
10	6 01	4 51
20	6 06	4 54
30	6 12	4 53
35	6 15	4 53
40	6 19	4 51
45	6 23	4 47
50	6 28	4 42
52	6 31	4 41
54	6 33	4 38
56	6 36	4 35
58	6 39	4 31
60	6 42	4 27
S		

Lat. N °	Sunset h m	Twlt. ends h m
72	19 39	////
70	19 28	////
68	19 19	////
66	19 11	////
64	19 05	22 53
62	18 59	22 11
60	18 55	21 45
58	18 50	21 24
56	18 47	21 09
54	18 43	20 55
52	18 40	20 44
50	18 38	20 35
45	18 32	20 16
40	18 27	20 01
35	18 23	19 50
30	18 19	19 41
20	18 13	19 27
10	18 07	19 18
0	18 02	19 11
10	17 57	19 07
20	17 52	19 05
30	17 47	19 07
35	17 43	19 07
40	17 40	19 10
45	17 36	19 14
50	17 31	19 19
52	17 28	19 20
54	17 26	19 24
56	17 23	19 27
58	17 20	19 31
60	17 17	19 36

Lat. N °	Moonrise 3 h m	4 h m	5 h m	6 h m
72	1 53	4 10	6 19	8 26
70	2 13	4 18	6 19	8 17
68	2 28	4 25	6 19	8 10
66	2 40	4 31	6 18	8 04
64	2 51	4 35	6 18	7 59
62	2 59	4 39	6 18	7 54
60	3 07	4 43	6 18	7 50
58	3 13	4 46	6 18	7 47
56	3 19	4 49	6 18	7 44
54	3 24	4 51	6 17	7 41
52	3 29	4 54	6 17	7 39
50	3 33	4 56	6 17	7 37
45	3 42	5 00	6 17	7 32
40	3 50	5 04	6 17	7 28
35	3 56	5 07	6 17	7 25
30	4 02	5 10	6 16	7 22
20	4 12	5 15	6 16	7 17
10	4 20	5 19	6 16	7 12
0	4 28	5 23	6 16	7 08
10	4 36	5 27	6 16	7 04
20	4 45	5 31	6 16	7 00
30	4 54	5 36	6 16	6 55
35	5 00	5 39	6 16	6 52
40	5 06	5 42	6 16	6 49
45	5 13	5 46	6 16	6 45
50	5 22	5 50	6 16	6 41
52	5 26	5 52	6 16	6 39
54	5 30	5 54	6 16	6 37
56	5 35	5 57	6 16	6 35
58	5 41	5 59	6 16	6 32
60	5 47	6 02	6 16	6 29

Lat. N °	Moonset 3 h m	4 h m	5 h m	6 h m
72	18 36	18 19	18 04	17 47
70	18 25	18 16	18 08	17 59
68	18 16	18 14	18 11	18 08
66	18 09	18 11	18 14	18 16
64	18 02	18 09	18 16	18 23
62	17 57	18 08	18 18	18 29
60	17 52	18 06	18 20	18 34
58	17 48	18 05	18 21	18 38
56	17 44	18 04	18 23	18 42
54	17 40	18 03	18 24	18 46
52	17 37	18 02	18 25	18 49
50	17 34	18 01	18 26	18 52
45	17 28	17 59	18 29	18 58
40	17 23	17 57	18 31	19 04
35	17 18	17 56	18 32	19 09
30	17 14	17 54	18 34	19 13
20	17 07	17 52	18 36	19 20
10	17 00	17 50	18 39	19 26
0	16 54	17 48	18 41	19 32
10	16 48	17 46	18 43	19 38
20	16 42	17 44	18 45	19 45
30	16 34	17 42	18 48	19 52
35	16 30	17 40	18 49	19 56
40	16 25	17 39	18 51	20 01
45	16 19	17 37	18 53	20 07
50	16 12	17 34	18 55	20 14
52	16 09	17 33	18 56	20 17
54	16 05	17 32	18 57	20 20
56	16 01	17 31	18 59	20 24
58	15 57	17 29	19 00	20 28
60	15 52	17 28	19 02	20 33

DAY	GMT of Transit Meridian of Greenwich Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
3	10 41	8 56	0 46	12 04	16 50
4	11 36	8 56	0 41	12 01	16 46
5	12 28	8 56	0 36	11 58	16 43
6	13 20	8 57	0 31	11 55	16 39

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.2	0.2	0.4
30	0.2	0.2	0.3
45	0.2	0.1	0.2
60	0.2	0.1	0.1
75	0.2	0.0	0.1
90			

Moon's Lower Limb **Add**

Alt. °	3 ′	4 ′	5 ′
0	20.3	20.0	19.4
4	20.2	20.0	19.4
8	20.2	20.0	19.3
12	20.1	19.9	19.3
16	20.1	19.8	19.2
20	20.0	19.8	19.2
24	19.9	19.6	19.1
28	19.8	19.5	19.0
32	19.6	19.4	18.9
36	19.5	19.3	18.7
40	19.3	19.1	18.6
44	19.1	18.9	18.5
48	18.9	18.8	18.3
52	18.7	18.6	18.1
56	18.5	18.4	18.0
60	18.3	18.1	17.8
64	18.1	17.9	17.6
68	17.8	17.7	17.4
72	17.6	17.5	17.2
76	17.3	17.2	17.0
80	17.1	17.0	16.8
84	16.8	16.7	16.6
88	16.6	16.6	16.4
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt. °	3 ′	4 ′	5 ′
0	12.9	13.0	13.4
4	12.9	13.0	13.4
8	12.9	13.1	13.4
12	13.0	13.1	13.5
16	13.0	13.2	13.5
20	13.1	13.3	13.6
24	13.2	13.4	13.7
28	13.4	13.5	13.8
32	13.5	13.6	13.9
36	13.6	13.7	14.0
40	13.8	13.9	14.1
44	14.0	14.1	14.3
48	14.2	14.3	14.4
52	14.4	14.4	14.6
56	14.6	14.6	14.8
60	14.8	14.9	15.0
64	15.1	15.1	15.1
68	15.3	15.3	15.3
72	15.5	15.5	15.5
76	15.8	15.8	15.7
80	16.0	16.0	15.9
84	16.3	16.3	16.2
88	16.5	16.4	16.3
90			

Subtract from table, back cover

Labor Day	3
New Moon	4

GMT	♈ GHA	VENUS −3.9 GHA	VENUS −3.9 Dec.	MARS −2.6 GHA	MARS −2.6 Dec.	JUPITER −1.2 GHA	JUPITER −1.2 Dec.	SATURN 0.8 GHA	SATURN 0.8 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
6 00	345 03.6	225 52.8	+18 20.8	352 17.1	− 9 45.9	180 56.1	+ 7 49.2	109 37.6	−17 43.6	166 52.3	97	− 4 04.0	−131
01	0 06.0	240 52.6	20.5	7 20.2	46.1	195 58.1	49.0	124 39.9	43.6	181 21.0	97	4 17.1	−130
02	15 08.5	255 52.5	20.2	22 23.4	46.3	211 00.0	48.8	139 42.2	43.7	195 49.7	98	4 30.1	−129
03	30 10.9	270 52.3	20.0	37 26.5	46.5	226 02.0	48.6	154 44.6	43.7	210 18.5	98	4 43.0	−129
04	45 13.4	285 52.1	19.7	52 29.6	46.7	241 03.9	48.4	169 46.9	43.7	224 47.3	97	4 55.9	−129
05	60 15.9	300 52.0	19.4	67 32.7	46.9	256 05.9	48.1	184 49.2	43.8	239 16.0	98	5 08.8	−128
06	75 18.3	315 51.8	+18 19.2	82 35.8	− 9 47.1	271 07.8	+ 7 47.9	199 51.5	−17 43.8	253 44.8	98	− 5 21.6	−128
07	90 20.8	330 51.6	18.9	97 39.0	47.3	286 09.8	47.7	214 53.8	43.9	268 13.6	98	5 34.4	−127
08	105 23.3	345 51.5	18.6	112 42.1	47.5	301 11.8	47.5	229 56.1	43.9	282 42.4	99	5 47.1	−127
09	120 25.7	0 51.3	18.3	127 45.2	47.7	316 13.7	47.3	244 58.5	43.9	297 11.3	98	5 59.8	−127
10	135 28.2	15 51.1	18.1	142 48.3	47.9	331 15.7	47.1	260 00.8	44.0	311 40.1	99	6 12.5	−125
11	150 30.7	30 51.0	17.8	157 51.5	48.1	346 17.6	46.9	275 03.1	44.0	326 09.0	98	6 25.0	−126
12	165 33.1	45 50.8	+18 17.5	172 54.6	− 9 48.3	1 19.6	+ 7 46.7	290 05.4	−17 44.1	340 37.8	99	− 6 37.6	−125
13	180 35.6	60 50.6	17.2	187 57.7	48.5	16 21.5	46.5	305 07.7	44.1	355 06.7	99	6 50.1	−124
14	195 38.0	75 50.4	17.0	203 00.9	48.7	31 23.5	46.3	320 10.0	44.2	9 35.6	99	7 02.5	−124
15	210 40.5	90 50.3	16.7	218 04.0	48.9	46 25.5	46.1	335 12.4	44.2	24 04.5	99	7 14.9	−123
16	225 43.0	105 50.1	16.4	233 07.1	49.1	61 27.4	45.9	350 14.7	44.2	38 33.4	99	7 27.2	−123
17	240 45.4	120 49.9	16.1	248 10.2	49.3	76 29.4	45.7	5 17.0	44.3	53 02.3	99	7 39.5	−122
18	255 47.9	135 49.8	+18 15.8	263 13.4	− 9 49.5	91 31.3	+ 7 45.5	20 19.3	−17 44.3	67 31.2	99	− 7 51.7	−121
19	270 50.4	150 49.6	15.6	278 16.5	49.7	106 33.3	45.3	35 21.6	44.4	82 00.1	100	8 03.8	−121
20	285 52.8	165 49.4	15.3	293 19.6	49.9	121 35.2	45.1	50 23.9	44.4	96 29.1	99	8 15.9	−120
21	300 55.3	180 49.2	15.0	308 22.8	50.1	136 37.2	44.9	65 26.3	44.4	110 58.0	99	8 27.9	−120
22	315 57.8	195 49.1	14.7	323 25.9	50.3	151 39.2	44.7	80 28.6	44.5	125 26.9	100	8 39.9	−119
23	331 00.2	210 48.9	14.4	338 29.0	50.5	166 41.1	44.4	95 30.9	44.5	139 55.9	100	8 51.8	−118
7 00	346 02.7	225 48.7	+18 14.1	353 32.1	− 9 50.6	181 43.1	+ 7 44.2	110 33.2	−17 44.6	154 24.9	99	− 9 03.6	−118
01	1 05.2	240 48.5	13.9	8 35.3	50.8	196 45.0	44.0	125 35.5	44.6	168 53.8	100	9 15.4	−117
02	16 07.6	255 48.4	13.6	23 38.4	51.0	211 47.0	43.8	140 37.8	44.7	183 22.8	100	9 27.1	−116
03	31 10.1	270 48.2	13.3	38 41.5	51.2	226 49.0	43.6	155 40.2	44.7	197 51.8	99	9 38.7	−116
04	46 12.5	285 48.0	13.0	53 44.7	51.4	241 50.9	43.4	170 42.5	44.7	212 20.7	100	9 50.3	−115
05	61 15.0	300 47.8	12.7	68 47.8	51.6	256 52.9	43.2	185 44.8	44.8	226 49.7	100	10 01.8	−114
06	76 17.5	315 47.7	+18 12.4	83 50.9	− 9 51.8	271 54.8	+ 7 43.0	200 47.1	−17 44.8	241 18.7	100	−10 13.2	−113
07	91 19.9	330 47.5	12.1	98 54.1	52.0	286 56.8	42.8	215 49.4	44.9	255 47.7	100	10 24.5	−113
08	106 22.4	345 47.3	11.8	113 57.2	52.2	301 58.7	42.6	230 51.7	44.9	270 16.7	100	10 35.8	−112
09	121 24.9	0 47.1	11.5	129 00.3	52.4	317 00.7	42.4	245 54.0	45.0	284 45.7	100	−10 47.0	−111
10	136 27.3	15 46.9	11.2	144 03.5	52.6	332 02.7	42.2	260 56.4	45.0	299 14.7	100	10 58.1	−111
11	151 29.8	30 46.8	11.0	159 06.6	52.8	347 04.6	42.0	275 58.7	45.0	313 43.7	100	11 09.2	−110
12	166 32.3	45 46.6	+18 10.7	174 09.7	− 9 53.0	2 06.6	+ 7 41.8	291 01.0	−17 45.1	328 12.7	100	−11 20.2	−109
13	181 34.7	60 46.4	10.4	189 12.9	53.2	17 08.5	41.6	306 03.3	45.1	342 41.7	100	11 31.1	−108
14	196 37.2	75 46.2	10.1	204 16.0	53.4	32 10.5	41.4	321 05.6	45.2	357 10.7	100	11 41.9	−107
15	211 39.7	90 46.0	09.8	219 19.2	53.6	47 12.5	41.2	336 07.9	45.2	11 39.7	100	−11 52.6	−107
16	226 42.1	105 45.8	09.5	234 22.3	53.8	62 14.4	40.9	351 10.2	45.3	26 08.7	100	12 03.3	−106
17	241 44.6	120 45.7	09.2	249 25.4	54.0	77 16.4	40.7	6 12.6	45.3	40 37.7	100	12 13.9	−104
18	256 47.0	135 45.5	+18 08.9	264 28.6	− 9 54.2	92 18.3	+ 7 40.5	21 14.9	−17 45.3	55 06.7	100	−12 24.3	−105
19	271 49.5	150 45.3	08.6	279 31.7	54.4	107 20.3	40.3	36 17.2	45.4	69 35.7	100	12 34.8	−103
20	286 52.0	165 45.1	08.3	294 34.8	54.5	122 22.2	40.1	51 19.5	45.4	84 04.7	100	12 45.1	−102
21	301 54.4	180 44.9	08.0	309 38.0	54.7	137 24.2	39.9	66 21.8	45.5	98 33.7	100	−12 55.3	−102
22	316 56.9	195 44.7	07.7	324 41.1	54.9	152 26.2	39.7	81 24.1	45.5	113 02.7	100	13 05.5	−101
23	331 59.4	210 44.5	07.4	339 44.2	55.1	167 28.1	39.5	96 26.4	45.6	127 31.7	100	13 15.6	−100
8 00	347 01.8	225 44.4	+18 07.1	354 47.4	− 9 55.3	182 30.1	+ 7 39.3	111 28.7	−17 45.6	142 00.7	100	−13 25.6	− 99
01	2 04.3	240 44.2	06.8	9 50.5	55.5	197 32.0	39.1	126 31.0	45.6	156 29.7	100	13 35.5	− 98
02	17 06.8	255 44.0	06.4	24 53.7	55.7	212 34.0	38.9	141 33.4	45.7	170 58.7	100	13 45.3	− 97
03	32 09.2	270 43.8	06.1	39 56.8	55.9	227 36.0	38.7	156 35.7	45.7	185 27.7	100	−13 55.0	− 96
04	47 11.7	285 43.6	05.8	54 59.9	56.1	242 37.9	38.5	171 38.0	45.8	199 56.7	100	14 04.6	− 96
05	62 14.1	300 43.4	05.5	70 03.1	56.3	257 39.9	38.3	186 40.3	45.8	214 25.7	100	14 14.2	− 94
06	77 16.6	315 43.2	+18 05.2	85 06.2	− 9 56.5	272 41.8	+ 7 38.1	201 42.6	−17 45.9	228 54.7	100	−14 23.6	− 94
07	92 19.1	330 43.0	04.9	100 09.4	56.6	287 43.8	37.9	216 44.9	45.9	243 23.7	100	14 33.0	− 92
08	107 21.5	345 42.8	04.6	115 12.5	56.8	302 45.7	37.7	231 47.2	45.9	257 52.7	100	14 42.2	− 92
09	122 24.0	0 42.7	04.3	130 15.6	57.0	317 47.7	37.4	246 49.5	46.0	272 21.7	100	−14 51.4	− 91
10	137 26.5	15 42.5	04.0	145 18.8	57.2	332 49.7	37.2	261 51.9	46.0	286 50.7	100	15 00.5	− 90
11	152 28.9	30 42.3	03.7	160 21.9	57.4	347 51.6	37.0	276 54.2	46.1	301 19.7	100	15 09.5	− 89
12	167 31.4	45 42.1	+18 03.3	175 25.1	− 9 57.6	2 53.6	+ 7 36.8	291 56.5	−17 46.1	315 48.7	100	−15 18.4	− 88
13	182 33.9	60 41.9	03.0	190 28.2	57.8	17 55.5	36.6	306 58.8	46.2	330 17.7	100	15 27.2	− 87
14	197 36.3	75 41.7	02.7	205 31.3	58.0	32 57.5	36.4	322 01.1	46.2	344 46.7	100	15 35.9	− 86
15	212 38.8	90 41.5	02.4	220 34.5	58.2	47 59.5	36.2	337 03.4	46.2	359 15.7	100	−15 44.5	− 85
16	227 41.3	105 41.3	02.1	235 37.6	58.3	63 01.4	36.0	352 05.7	46.3	13 44.7	100	15 53.0	− 84
17	242 43.7	120 41.1	01.8	250 40.8	58.5	78 03.4	35.8	7 08.0	46.3	28 13.7	100	16 01.4	− 83
18	257 46.2	135 40.9	+18 01.4	265 43.9	− 9 58.7	93 05.3	+ 7 35.6	22 10.3	−17 46.4	42 42.7	99	−16 09.7	− 82
19	272 48.6	150 40.7	01.1	280 47.1	58.9	108 07.3	35.4	37 12.6	46.4	57 11.6	100	16 17.9	− 81
20	287 51.1	165 40.5	00.8	295 50.2	59.1	123 09.3	35.2	52 14.9	46.5	71 40.6	100	16 26.0	− 80
21	302 53.6	180 40.3	00.5	310 53.3	59.3	138 11.2	35.0	67 17.3	46.5	86 09.6	100	−16 34.0	− 79
22	317 56.0	195 40.1	18 00.1	325 56.5	59.5	153 13.2	34.8	82 19.6	46.5	100 38.6	100	16 41.9	− 79
23	332 58.5	210 39.9	17 59.8	340 59.6	59.6	168 15.1	34.6	97 21.9	46.6	115 07.6	100	16 49.8	− 77
24	348 01.0	225 39.7	+17 59.5	356 02.8	− 9 59.8	183 17.1	+ 7 34.4	112 24.2	−17 46.6	129 36.6	100	−16 57.5	− 76
code	−	− 2	− 3	+ 32	− 2	+ 19	− 2	+ 23	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
6 00	180 23.2	+ 6 32.3	7	Acamar	315 50.4	−40 28.3
01	195 23.4	31.4	5	Achernar	335 57.9	−57 27.1
02	210 23.6	30.4	30	Acrux	173 57.6	−62 51.7
03	225 23.8	·· 29.5	19	Adhara	255 46.2	−28 54.6
04	240 24.0	28.6	10	Aldebaran	291 38.2	+16 25.4
05	255 24.3	27.6				
06	270 24.5	+ 6 26.7	32	Alioth	166 58.4	+56 11.8
07	285 24.7	25.8	34	Alkaid	153 32.7	+49 31.9
08	300 24.9	24.9	55	Al Na'ir	28 36.6	−47 10.1
09	315 25.1	·· 23.9	15	Alnilam	276 29.6	− 1 13.6
10	330 25.3	23.0	25	Alphard	218 38.2	− 8 28.2
11	345 25.5	22.1				
12	0 25.7	+ 6 21.1	41	Alphecca	126 47.2	+26 51.8
13	15 25.9	20.2	1	Alpheratz	358 27.2	+28 51.3
14	30 26.1	19.3	51	Altair	62 49.5	+ 8 45.4
15	45 26.3	·· 18.3	2	Ankaa	353 57.2	−42 32.2
16	60 26.6	17.4	42	Antares	113 18.5	−26 20.3
17	75 26.8	16.5				
18	90 27.0	+ 6 15.5	37	Arcturus	146 34.7	+19 24.6
19	105 27.2	14.6	43	Atria	108 58.6	−68 57.3
20	120 27.4	13.6	22	Avior	234 35.9	−59 22.0
21	135 27.6	·· 12.7	13	Bellatrix	279 17.7	+ 6 18.8
22	150 27.8	11.8	16	Betelg'se	271 47.4	+ 7 24.1
23	165 28.0	10.8				
			17	Canopus	264 15.2	−52 40.0
7 00	180 28.2	+ 6 09.9	12	Capella	281 37.4	+45 57.2
01	195 28.5	09.0	53	Deneb	50 00.1	+45 07.8
02	210 28.7	08.0	28	Denebola	183 17.3	+14 48.9
03	225 28.9	·· 07.1	4	Diphda	349 38.2	−18 13.2
04	240 29.1	06.2				
05	255 29.3	05.2	27	Dubhe	194 44.4	+61 59.1
06	270 29.5	+ 6 04.3	14	Elnath	279 06.5	+28 34.3
07	285 29.7	03.4	47	Eltanin	91 05.8	+51 30.0
08	300 29.9	02.4	54	Enif	34 28.6	+ 9 40.8
09	315 30.1	·· 01.5	56	Fomalhaut	16 10.5	−29 50.9
10	330 30.4	6 00.5				
11	345 30.6	5 59.6	31	Gacrux	172 48.9	−56 52.4
12	0 30.8	+ 5 58.7	29	Gienah	176 36.4	−17 18.1
13	15 31.0	57.7	35	Hadar	149 48.8	−60 10.1
14	30 31.2	56.8	6	Hamal	328 48.6	+23 15.6
15	45 31.4	·· 55.9	48	Kaus Aust.	84 40.1	−34 24.4
16	60 31.6	54.9				
17	75 31.8	54.0	40	Kochab	137 18.7	+74 20.2
18	90 32.1	+ 5 53.0	57	Markab	14 20.4	+14 58.6
19	105 32.3	52.1	8	Menkar	314 59.4	+ 3 55.4
20	120 32.5	51.2	36	Menkent	148 58.1	−36 09.6
21	135 32.7	·· 50.2	24	Miapl'dus	221 49.6	−69 32.3
22	150 32.9	49.3				
23	165 33.1	48.3	9	Mirfak	309 41.1	+49 42.4
			50	Nunki	76 50.8	−26 21.1
8 00	180 33.3	+ 5 47.4	52	Peacock	54 25.7	−56 52.5
01	195 33.5	46.5	21	Pollux	244 19.9	+28 07.9
02	210 33.8	45.5	20	Procyon	245 44.4	+ 5 20.3
03	225 34.0	·· 44.6				
04	240 34.2	43.6	46	R'alhague	96 45.9	+12 35.7
05	255 34.4	42.7	26	Regulus	208 29.1	+12 10.8
06	270 34.6	+ 5 41.8	11	Rigel	281 53.0	− 8 14.9
07	285 34.8	40.8	38	Rigil Kent.	140 50.3	−60 39.7
08	300 35.0	39.9	44	Sabik	103 01.3	−15 40.3
09	315 35.2	·· 38.9				
10	330 35.5	38.0	3	Schedar	350 28.6	+56 18.1
11	345 35.7	37.1	45	Shaula	97 19.6	−37 04.5
12	0 35.9	+ 5 36.1	18	Sirius	259 11.4	−16 39.2
13	15 36.1	35.2	33	Spica	159 16.4	−10 56.1
14	30 36.3	34.2	23	Suhail	223 24.2	−43 15.3
15	45 36.5	·· 33.3				
16	60 36.7	32.4	49	Vega	81 07.6	+38 44.9
17	75 37.0	31.4	39	Zub'g'bi	137 52.7	−15 51.8
18	90 37.2	+ 5 30.5				
19	105 37.4	29.5				
20	120 37.6	28.6				
21	135 37.8	·· 27.6				
22	150 38.0	26.7				
23	165 38.2	25.8				
24	180 38.5	+ 5 24.8				
code	—	− 10				

GMT	Equation of Time (App. Mean) 6	7	8
h	m s	m s	m s
0	+ 1 32.4	+ 1 52.6	+ 2 12.9
6	+ 1 37.4	+ 1 57.6	+ 2 18.0
12	+ 1 42.5	+ 2 02.7	+ 2 23.1
18	+ 1 47.5	+ 2 07.8	+ 2 28.2
24	+ 1 52.6	+ 2 12.9	+ 2 33.4

Lat. N °	Sunrise h m	Twlt. begins h m	Moonrise 6 h m	7 h m	8 h m	9 h m
72	4 30	////	8 26	10 35	12 55	▬
70	4 40	////	8 17	10 15	12 16	14 26
68	4 48	////	8 10	9 59	11 49	13 36
66	4 54	////	8 04	9 47	11 28	13 05
64	5 00	1 22	7 59	9 37	11 12	12 42
62	5 05	1 57	7 54	9 28	10 59	12 24
60	5 09	2 21	7 50	9 21	10 47	12 08
58	5 13	2 39	7 47	9 14	10 38	11 56
56	5 16	2 54	7 44	9 08	10 29	11 45
54	5 19	3 07	7 41	9 03	10 21	11 35
52	5 21	3 17	7 39	8 58	10 15	11 26
50	5 24	3 26	7 37	8 54	10 09	11 19
45	5 29	3 45	7 32	8 45	9 56	11 02
40	5 33	3 58	7 28	8 38	9 45	10 49
35	5 37	4 09	7 25	8 31	9 36	10 37
30	5 40	4 19	7 22	8 26	9 28	10 28
20	5 46	4 31	7 17	8 16	9 14	10 11
10	5 50	4 40	7 12	8 07	9 02	9 56
0	5 55	4 46	7 08	8 00	8 51	9 42
10	5 59	4 50	7 04	7 52	8 40	9 28
20	6 03	4 51	7 00	7 43	8 28	9 14
30	6 08	4 50	6 55	7 34	8 15	8 57
35	6 11	4 48	6 52	7 29	8 07	8 48
40	6 14	4 46	6 49	7 23	7 58	8 37
45	6 17	4 41	6 45	7 16	7 48	8 24
50	6 22	4 36	6 41	7 07	7 36	8 08
52	6 23	4 33	6 39	7 04	7 30	8 01
54	6 26	4 30	6 37	6 59	7 24	7 53
56	6 28	4 27	6 35	6 55	7 17	7 44
58	6 30	4 22	6 32	6 50	7 10	7 34
60	6 33	4 16	6 29	6 44	7 01	7 23

Lat. N °	Sunset h m	Twlt. ends h m	Moonset 6 h m	7 h m	8 h m	9 h m
72	19 23	////	17 47	17 27	16 55	▬
70	19 13	////	17 59	17 49	17 36	17 12
68	19 06	////	18 08	18 06	18 04	18 03
66	18 59	23 27	18 16	18 20	18 25	18 35
64	18 54	22 23	18 23	18 31	18 42	18 59
62	18 50	21 52	18 29	18 41	18 56	19 18
60	18 46	21 30	18 34	18 49	19 08	19 33
58	18 42	21 12	18 38	18 57	19 19	19 46
56	18 39	20 58	18 42	19 03	19 28	19 58
54	18 36	20 46	18 46	19 09	19 36	20 08
52	18 33	20 35	18 49	19 15	19 43	20 17
50	18 31	20 26	18 52	19 19	19 50	20 25
45	18 26	20 09	18 58	19 30	20 04	20 42
40	18 22	19 56	19 04	19 39	20 16	20 56
35	18 18	19 44	19 09	19 46	20 26	21 08
30	18 15	19 36	19 13	19 53	20 34	21 18
20	18 10	19 24	19 20	20 04	20 50	21 36
10	18 05	19 15	19 26	20 14	21 03	21 52
0	18 01	19 10	19 32	20 24	21 15	22 07
10	17 57	19 07	19 38	20 33	21 28	22 21
20	17 53	19 06	19 45	20 44	21 41	22 37
30	17 48	19 07	19 52	20 55	21 57	22 55
35	17 46	19 10	19 56	21 02	22 05	23 06
40	17 43	19 13	20 01	21 10	22 16	23 18
45	17 39	19 17	20 07	21 19	22 28	23 32
50	17 35	19 23	20 14	21 30	22 42	23 50
52	17 33	19 26	20 17	21 35	22 49	23 58
54	17 31	19 29	20 20	21 40	22 57	24 07
56	17 29	19 33	20 24	21 47	23 05	24 18
58	17 27	19 39	20 28	21 54	23 15	24 30
60	17 24	19 44	20 33	22 02	23 26	24 44

GMT of Transit
Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
6	13 20	8 57	0 31	11 55	16 39
7	14 12	8 57	0 26	11 52	16 35
8	15 03	8 57	0 21	11 48	16 32
9	15 54	8 58	0 16	11 45	16 28

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.2	0.2	0.4
30	0.2	0.2	0.3
45	0.2	0.1	0.2
60	0.2	0.1	0.1
75	0.2	0.0	0.1
90			

Moon's Lower Limb **Add**

Alt. °	6 ′	7 ′	8 ′
0	18.5	17.5	16.3
4	18.5	17.5	16.3
8	18.4	17.4	16.3
12	18.4	17.4	16.3
16	18.4	17.4	16.3
20	18.3	17.4	16.3
24	18.2	17.3	16.3
28	18.2	17.3	16.2
32	18.1	17.2	16.2
36	18.0	17.1	16.2
40	17.9	17.1	16.2
44	17.8	17.0	16.1
48	17.7	16.9	16.1
52	17.5	16.8	16.1
56	17.4	16.8	16.0
60	17.3	16.7	16.0
64	17.1	16.6	16.0
68	17.0	16.5	15.9
72	16.8	16.4	15.9
76	16.7	16.3	15.8
80	16.5	16.2	15.8
84	16.3	16.1	15.8
88	16.2	16.0	15.7
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt. °	6 ′	7 ′	8 ′
0	13.9	14.5	15.1
4	13.9	14.5	15.1
8	13.9	14.5	15.1
12	13.9	14.5	15.1
16	14.0	14.5	15.1
20	14.0	14.6	15.2
24	14.1	14.6	15.2
28	14.2	14.7	15.2
32	14.3	14.7	15.2
36	14.4	14.8	15.2
40	14.5	14.8	15.3
44	14.6	14.9	15.3
48	14.7	15.0	15.3
52	14.8	15.1	15.4
56	15.0	15.2	15.4
60	15.1	15.3	15.4
64	15.2	15.3	15.5
68	15.4	15.4	15.5
72	15.5	15.5	15.5
76	15.7	15.6	15.6
80	15.9	15.8	15.6
84	16.0	15.9	15.7
88	16.1	15.9	15.7
90			

Subtract from table, back cover

Hebrew New Year
(Rosh Hashanah) 6

GMT	♈ GHA	VENUS −3.9 GHA	VENUS −3.9 Dec	MARS −2.6 GHA	MARS −2.6 Dec	JUPITER −1.2 GHA	JUPITER −1.2 Dec	SATURN 0.8 GHA	SATURN 0.8 Dec	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
9 00	348 01.0	225 39.7	+17 59.5	356 02.8	− 9 59.8	183 17.1	+ 7 34.4	112 24.2	−17 46.6	129 36.6	100	−16 57.5	− 76
01	3 03.4	240 39.5	59.2	11 05.9	10 00.0	198 19.0	34.2	127 26.5	46.7	144 05.6	99	17 05.1	− 75
02	18 05.9	255 39.3	58.8	26 09.1	00.2	213 21.0	33.9	142 28.8	46.7	158 34.5	100	17 12.6	− 74
03	33 08.4	270 39.1	·· 58.5	41 12.2	·· 00.4	228 23.0	·· 33.7	157 31.1	·· 46.8	173 03.5	100	·17 20.0	− 73
04	48 10.8	285 38.9	58.2	56 15.4	00.6	243 24.9	33.5	172 33.4	46.8	187 32.5	100	17 27.3	− 72
05	63 13.3	300 38.7	57.9	71 18.5	00.8	258 26.9	33.3	187 35.7	46.9	202 01.5	100	17 34.5	− 71
06	78 15.7	315 38.5	+17 57.5	86 21.6	−10 00.9	273 28.8	+ 7 33.1	202 38.0	−17 46.9	216 30.5	100	−17 41.6	− 70
07	93 18.2	330 38.3	57.2	101 24.8	01.1	288 30.8	32.9	217 40.3	46.9	230 59.5	100	17 48.6	− 69
08	108 20.7	345 38.1	56.9	116 27.9	01.3	303 32.8	32.7	232 42.6	47.0	245 28.5	100	17 55.5	− 67
09	123 23.1	0 37.9	·· 56.5	131 31.1	·· 01.5	318 34.7	·· 32.5	247 44.9	·· 47.0	259 57.5	100	·18 02.2	− 67
10	138 25.6	15 37.7	56.2	146 34.2	01.7	333 36.7	32.3	262 47.3	47.1	274 26.5	99	18 08.9	− 66
11	153 28.1	30 37.5	55.9	161 37.4	01.9	348 38.6	32.1	277 49.6	47.1	288 55.4	100	18 15.5	− 65
12	168 30.5	45 37.3	+17 55.5	176 40.5	−10 02.0	3 40.6	+ 7 31.9	292 51.9	−17 47.2	303 24.4	100	−18 22.0	− 63
13	183 33.0	60 37.1	55.2	191 43.7	02.2	18 42.6	31.7	307 54.2	47.2	317 53.4	100	18 28.3	− 63
14	198 35.5	75 36.9	54.9	206 46.8	02.4	33 44.5	31.5	322 56.5	47.3	332 22.4	101	18 34.6	− 61
15	213 37.9	90 36.7	·· 54.5	221 50.0	·· 02.6	48 46.5	·· 31.3	337 58.8	·· 47.3	346 51.5	100	·18 40.7	− 60
16	228 40.4	105 36.5	54.2	236 53.1	02.8	63 48.4	31.1	353 01.1	47.3	1 20.5	100	18 46.7	− 60
17	243 42.9	120 36.3	53.9	251 56.2	02.9	78 50.4	30.9	8 03.4	47.4	15 49.5	100	18 52.7	− 58
18	258 45.3	135 36.1	+17 53.5	266 59.4	−10 03.1	93 52.3	+ 7 30.7	23 05.7	−17 47.4	30 18.5	100	−18 58.5	− 57
19	273 47.8	150 35.9	53.2	282 02.5	03.3	108 54.3	30.4	38 08.0	47.5	44 47.5	100	19 04.2	− 56
20	288 50.2	165 35.7	52.8	297 05.7	03.5	123 56.3	30.2	53 10.3	47.5	59 16.5	101	19 09.8	− 55
21	303 52.7	180 35.5	·· 52.5	312 08.8	·· 03.7	138 58.2	·· 30.0	68 12.6	·· 47.6	73 45.6	100	·19 15.3	− 54
22	318 55.2	195 35.2	52.2	327 12.0	03.8	154 00.2	29.8	83 14.9	47.6	88 14.6	100	19 20.7	− 53
23	333 57.6	210 35.0	51.8	342 15.1	04.0	169 02.1	29.6	98 17.2	47.6	102 43.6	101	19 26.0	− 52
10 00	349 00.1	225 34.8	+17 51.5	357 18.3	−10 04.2	184 04.1	+ 7 29.4	113 19.5	−17 47.7	117 12.7	100	−19 31.2	− 51
01	4 02.6	240 34.6	51.1	12 21.4	04.4	199 06.1	29.2	128 21.8	47.7	131 41.7	101	19 36.3	− 49
02	19 05.0	255 34.4	50.8	27 24.6	04.6	214 08.0	29.0	143 24.1	47.8	146 10.8	101	19 41.2	− 49
03	34 07.5	270 34.2	·· 50.4	42 27.7	·· 04.7	229 10.0	·· 28.8	158 26.5	·· 47.8	160 39.9	100	·19 46.1	− 47
04	49 10.0	285 34.0	50.1	57 30.9	04.9	244 11.9	28.6	173 28.8	47.9	175 08.9	101	19 50.8	− 46
05	64 12.4	300 33.8	49.7	72 34.0	05.1	259 13.9	28.4	188 31.1	47.9	189 38.0	101	19 55.4	− 45
06	79 14.9	315 33.6	+17 49.4	87 37.2	−10 05.3	274 15.9	+ 7 28.2	203 33.4	−17 48.0	204 07.1	101	−19 59.9	− 45
07	94 17.4	330 33.4	49.0	102 40.3	05.4	289 17.8	28.0	218 35.7	48.0	218 36.2	101	20 04.4	− 43
08	109 19.8	345 33.1	48.7	117 43.5	05.6	304 19.8	27.8	233 38.0	48.0	233 05.3	101	20 08.7	− 42
09	124 22.3	0 32.9	·· 48.3	132 46.6	·· 05.8	319 21.7	·· 27.6	248 40.3	·· 48.1	247 34.4	101	·20 12.9	− 40
10	139 24.7	15 32.7	48.0	147 49.8	06.0	334 23.7	27.4	263 42.6	48.1	262 03.5	102	20 16.9	− 40
11	154 27.2	30 32.5	47.6	162 52.9	06.2	349 25.7	27.2	278 44.9	48.2	276 32.7	101	20 20.9	− 39
12	169 29.7	45 32.3	+17 47.3	177 56.1	−10 06.3	4 27.6	+ 7 26.9	293 47.2	−17 48.2	291 01.8	102	−20 24.8	− 37
13	184 32.1	60 32.1	46.9	192 59.2	06.5	19 29.6	26.7	308 49.5	48.3	305 31.0	101	20 28.5	− 37
14	199 34.6	75 31.9	46.6	208 02.4	06.7	34 31.5	26.5	323 51.8	48.3	320 00.1	102	20 32.2	− 35
15	214 37.1	90 31.6	·· 46.2	223 05.5	·· 06.8	49 33.5	·· 26.3	338 54.1	·· 48.4	334 29.3	102	·20 35.7	− 34
16	229 39.5	105 31.4	45.8	238 08.6	07.0	64 35.4	26.1	353 56.4	48.4	348 58.5	102	20 39.1	− 33
17	244 42.0	120 31.2	45.5	253 11.8	07.2	79 37.4	25.9	8 58.7	48.4	3 27.7	102	20 42.4	− 32
18	259 44.5	135 31.0	+17 45.1	268 14.9	−10 07.4	94 39.4	+ 7 25.7	24 01.0	−17 48.5	17 56.9	103	−20 45.6	− 31
19	274 46.9	150 30.8	44.8	283 18.1	07.5	109 41.3	25.5	39 03.3	48.5	32 26.2	102	20 48.7	− 30
20	289 49.4	165 30.6	44.4	298 21.2	07.7	124 43.3	25.3	54 05.6	48.6	46 55.4	103	20 51.7	− 29
21	304 51.8	180 30.3	·· 44.1	313 24.4	·· 07.9	139 45.2	·· 25.1	69 07.9	·· 48.6	61 24.7	102	·20 54.6	− 27
22	319 54.3	195 30.1	43.7	328 27.5	08.1	154 47.2	24.9	84 10.2	48.7	75 53.9	103	20 57.3	− 27
23	334 56.8	210 29.9	43.3	343 30.7	08.2	169 49.2	24.7	99 12.5	48.7	90 23.2	103	21 00.0	− 25
11 00	349 59.2	225 29.7	+17 43.0	358 33.8	−10 08.4	184 51.1	+ 7 24.5	114 14.8	−17 48.8	104 52.5	103	−21 02.5	− 25
01	5 01.7	240 29.5	42.6	13 37.0	08.6	199 53.1	24.3	129 17.1	48.8	119 21.8	104	21 05.0	− 23
02	20 04.2	255 29.2	42.2	28 40.1	08.7	214 55.0	24.1	144 19.4	48.8	133 51.2	103	21 07.3	− 22
03	35 06.6	270 29.0	·· 41.9	43 43.3	·· 08.9	229 57.0	·· 23.9	159 21.7	·· 48.9	148 20.5	104	·21 09.5	− 21
04	50 09.1	285 28.8	41.5	58 46.4	09.1	244 59.0	23.7	174 24.0	48.9	162 49.9	104	21 11.6	− 20
05	65 11.6	300 28.6	41.1	73 49.6	09.3	260 00.9	23.4	189 26.3	49.0	177 19.3	104	21 13.6	− 19
06	80 14.0	315 28.4	+17 40.8	88 52.7	−10 09.4	275 02.9	+ 7 23.2	204 28.6	−17 49.0	191 48.7	104	−21 15.5	− 17
07	95 16.5	330 28.1	40.4	103 55.9	09.6	290 04.8	23.0	219 30.9	49.1	206 18.1	105	21 17.2	− 17
08	110 19.0	345 27.9	40.0	118 59.0	09.8	305 06.8	22.8	234 33.2	49.1	220 47.6	104	21 18.9	− 16
09	125 21.4	0 27.7	·· 39.6	134 02.2	·· 09.9	320 08.8	·· 22.6	249 35.5	·· 49.2	235 17.0	105	·21 20.5	− 14
10	140 23.9	15 27.5	39.3	149 05.3	10.1	335 10.7	22.4	264 37.8	49.2	249 46.5	105	21 21.9	− 13
11	155 26.3	30 27.2	38.9	164 08.5	10.3	350 12.7	22.2	279 40.1	49.3	264 16.0	105	21 23.2	− 13
12	170 28.8	45 27.0	+17 38.5	179 11.6	−10 10.4	5 14.6	+ 7 22.0	294 42.4	−17 49.3	278 45.5	106	−21 24.5	− 11
13	185 31.3	60 26.8	38.2	194 14.8	10.6	20 16.6	21.8	309 44.7	49.3	293 15.1	106	21 25.6	− 10
14	200 33.7	75 26.6	37.8	209 17.9	10.8	35 18.6	21.6	324 47.0	49.4	307 44.7	106	21 26.6	− 9
15	215 36.2	90 26.4	·· 37.4	224 21.1	·· 10.9	50 20.5	·· 21.4	339 49.3	·· 49.4	322 14.3	106	·21 27.5	− 8
16	230 38.7	105 26.1	37.0	239 24.2	11.1	65 22.5	21.2	354 51.6	49.5	336 43.9	106	21 28.3	− 7
17	245 41.1	120 25.9	36.6	254 27.4	11.3	80 24.4	21.0	9 53.9	49.5	351 13.5	107	21 29.0	− 6
18	260 43.6	135 25.7	+17 36.3	269 30.5	−10 11.4	95 26.4	+ 7 20.8	24 56.2	−17 49.6	5 43.2	107	−21 29.6	− 5
19	275 46.1	150 25.4	35.9	284 33.7	11.6	110 28.4	20.6	39 58.5	49.6	20 12.9	107	21 30.1	− 3
20	290 48.5	165 25.2	35.5	299 36.8	11.8	125 30.3	20.4	55 00.8	49.7	34 42.6	107	21 30.4	− 3
21	305 51.0	180 25.0	·· 35.1	314 40.0	·· 11.9	140 32.3	·· 20.2	70 03.1	·· 49.7	49 12.3	108	·21 30.7	− 2
22	320 53.5	195 24.8	34.7	329 43.1	12.1	155 34.2	19.9	85 05.4	49.8	63 42.1	107	21 30.9	0
23	335 55.9	210 24.5	34.4	344 46.3	12.2	170 36.2	19.7	100 07.7	49.8	78 11.8	109	21 30.9	0
24	350 58.4	225 24.3	+17 34.0	359 49.4	−10 12.4	185 38.2	+ 7 19.5	115 10.0	−17 49.8	92 41.7	108	−21 30.9	+ 2
code	—	− 2	− 4	+ 31	− 2	+ 20	− 2	+ 23	− 1				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
9 00	180 38.5	+ 5 24.8
01	195 38.7	23.9
02	210 38.9	22.9
03	225 39.1	22.0
04	240 39.3	21.0
05	255 39.5	20.1
06	270 39.7	+ 5 19.2
07	285 40.0	18.2
08	300 40.2	17.3
09	315 40.4	16.3
10	330 40.6	15.4
11	345 40.8	14.4
12	0 41.0	+ 5 13.5
13	15 41.3	12.5
14	30 41.5	11.6
15	45 41.7	10.6
16	60 41.9	09.7
17	75 42.1	08.8
18	90 42.3	+ 5 07.8
19	105 42.6	06.9
20	120 42.8	05.9
21	135 43.0	05.0
22	150 43.2	04.0
23	165 43.4	03.1
10 00	180 43.6	+ 5 02.1
01	195 43.9	01.2
02	210 44.1	5 00.2
03	225 44.3	4 59.3
04	240 44.5	58.3
05	255 44.7	57.4
06	270 44.9	+ 4 56.4
07	285 45.2	55.5
08	300 45.4	54.6
09	315 45.6	53.6
10	330 45.8	52.7
11	345 46.0	51.7
12	0 46.2	+ 4 50.8
13	15 46.5	49.8
14	30 46.7	48.9
15	45 46.9	47.9
16	60 47.1	47.0
17	75 47.3	46.0
18	90 47.5	+ 4 45.1
19	105 47.8	44.1
20	120 48.0	43.2
21	135 48.2	42.2
22	150 48.4	41.3
23	165 48.6	40.3
11 00	180 48.8	+ 4 39.4
01	195 49.1	38.4
02	210 49.3	37.5
03	225 49.5	36.5
04	240 49.7	35.6
05	255 49.9	34.6
06	270 50.2	+ 4 33.7
07	285 50.4	32.7
08	300 50.6	31.8
09	315 50.8	30.8
10	330 51.0	29.9
11	345 51.2	28.9
12	0 51.5	+ 4 28.0
13	15 51.7	27.0
14	30 51.9	26.0
15	45 52.1	25.1
16	60 52.3	24.1
17	75 52.6	23.2
18	90 52.8	+ 4 22.2
19	105 53.0	21.3
20	120 53.2	20.3
21	135 53.4	19.4
22	150 53.7	18.4
23	165 53.9	17.5
24	180 54.1	+ 4 16.5
code	—	− 10

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 50.4	−40 28.3
5	Achernar	335 57.9	−57 27.1
30	Acrux	173 57.6	−62 51.7
19	Adhara	255 46.1	−28 54.6
10	Aldebaran	291 38.2	+16 25.5
32	Alioth	166 58.5	+56 11.8
34	Alkaid	153 32.7	+49 31.9
55	Al Na'ir	28 36.6	−47 10.1
15	Alnilam	276 29.6	− 1 13.6
25	Alphard	218 38.2	− 8 28.2
41	Alphecca	126 47.2	+26 51.8
1	Alpheratz	358 27.2	+28 51.3
51	Altair	62 49.5	+ 8 45.4
2	Ankaa	353 57.2	−42 32.2
42	Antares	113 18.5	−26 20.3
37	Arcturus	146 34.8	+19 24.6
43	Atria	108 58.6	−68 57.3
22	Avior	234 35.9	−59 22.0
13	Bellatrix	279 17.7	+ 6 18.8
16	Betelg'se	271 47.4	+ 7 24.1
17	Canopus	264 15.2	−52 40.0
12	Capella	281 37.4	+45 57.2
53	Deneb	50 00.1	+45 07.8
28	Denebola	183 17.3	+14 48.9
4	Diphda	349 38.2	−18 13.2
27	Dubhe	194 44.4	+61 59.0
14	Elnath	279 06.4	+28 34.3
47	Eltanin	91 05.8	+51 30.0
54	Enif	34 28.6	+ 9 40.8
56	Fomalhaut	16 10.5	−29 50.9
31	Gacrux	172 48.9	−56 52.4
29	Gienah	176 36.4	−17 18.1
35	Hadar	149 48.8	−60 10.1
6	Hamal	328 48.6	+23 15.6
48	Kaus Aust.	84 40.1	−34 24.4
40	Kochab	137 18.7	+74 20.2
57	Markab	14 20.4	+14 58.6
8	Menkar	314 59.4	+ 3 55.4
36	Menkent	148 58.1	−36 09.5
24	Miapl'dus	221 49.6	−69 32.2
9	Mirfak	309 41.1	+49 42.4
50	Nunki	76 50.9	−26 21.1
52	Peacock	54 25.7	−56 52.5
21	Pollux	244 19.9	+28 07.8
20	Procyon	245 44.4	+ 5 20.3
46	R'alhague	96 45.9	+12 35.7
26	Regulus	208 29.1	+12 10.8
11	Rigel	281 53.0	− 8 14.9
38	Rigil Kent.	140 50.4	−60 39.7
44	Sabik	103 01.4	−15 40.3
3	Schedar	350 28.6	+56 18.1
45	Shaula	97 19.7	−37 04.5
18	Sirius	259 11.3	−16 39.2
33	Spica	159 16.4	−10 56.1
23	Suhail	223 24.1	−43 15.3
49	Vega	81 07.6	+38 44.9
39	Zub'g'bi	137 52.7	−15 51.8

Lat.	Sunrise	Twlt. begins	Moonrise 9	10	11	12
N °	h m	h m	h m	h m	h m	h m
72	4 44	////	▬	▬	▬	▬
70	4 52	////	▬	▬	▬	▬
68	4 59	////	14 26	▬	▬	▬
66	5 04	1 00	13 36	15 20	16 48	17 24
64	5 09	1 45	13 05	14 33	15 43	16 27
62	5 12	2 13	12 42	14 03	15 08	15 54
60	5 16	2 34	12 24	13 40	14 43	15 30
58	5 19	2 50	12 08	13 21	14 23	15 10
56	5 22	3 03	11 56	13 06	14 06	14 54
54	5 24	3 14	11 45	12 53	13 52	14 41
52	5 26	3 24	11 35	12 42	13 40	14 29
50	5 28	3 33	11 26	12 32	13 30	14 18
45	5 32	3 49	11 19	12 23	13 20	14 09
40	5 36	4 02	11 02	12 04	13 00	13 49
35	5 39	4 12	10 49	11 49	12 44	13 33
30	5 42	4 20	10 37	11 36	12 30	13 20
20	5 46	4 32	10 28	11 25	12 19	13 08
10	5 50	4 40	10 11	11 06	11 58	12 48
0	5 54	4 45	9 56	10 49	11 41	12 30
10	5 57	4 48	9 42	10 33	11 24	12 14
20	6 01	4 48	9 28	10 18	11 08	11 58
30	6 05	4 47	9 14	10 01	10 50	11 40
35	6 07	4 44	8 57	9 43	10 30	11 20
40	6 09	4 41	8 48	9 32	10 19	11 08
45	6 12	4 36	8 37	9 19	10 05	10 55
50	6 15	4 29	8 24	9 04	9 49	10 39
52	6 17	4 26	8 08	8 46	9 30	10 19
54	6 19	4 23	8 01	8 38	9 20	10 10
56	6 20	4 18	7 53	8 28	9 10	9 59
58	6 22	4 13	7 44	8 18	8 58	9 48
60	6 25	4 07	7 34	8 05	8 45	9 34
S			7 23	7 51	8 29	9 18

Lat.	Sunset	Twlt. ends	Moonset 9	10	11	12
N °	h m	h m	h m	h m	h m	h m
72	19 07	////	▬	▬	▬	▬
70	18 59	////	▬	▬	▬	▬
68	18 53	////	17 12	▬	▬	▬
66	18 48	22 41	18 03	18 06	18 24	19 31
64	18 44	22 01	18 35	18 54	19 29	20 27
62	18 40	21 35	18 59	19 24	20 04	21 00
60	18 36	21 15	19 18	19 48	20 29	21 25
58	18 33	20 59	19 33	20 06	20 49	21 44
56	18 31	20 47	19 46	20 22	21 06	22 00
54	18 29	20 36	19 58	20 35	21 20	22 13
52	18 27	20 27	20 08	20 46	21 32	22 25
50	18 25	20 19	20 17	20 56	21 43	22 35
45	18 21	20 03	20 25	21 05	21 52	22 45
40	18 17	19 50	20 42	21 25	22 12	23 04
35	18 14	19 40	20 56	21 40	22 28	23 20
30	18 12	19 33	21 08	21 53	22 42	23 33
20	18 07	19 21	21 18	22 05	22 54	23 45
10	18 04	19 14	21 36	22 25	23 14	24 05
0	18 00	19 09	21 52	22 42	23 32	24 22
10	17 57	19 07	22 07	22 58	23 48	24 38
20	17 54	19 07	22 21	23 14	24 05	0 05
30	17 50	19 09	22 37	23 31	24 23	0 23
35	17 48	19 12	22 55	23 51	24 43	0 43
40	17 45	19 15	23 06	24 02	0 02	0 55
45	17 43	19 21	23 18	24 16	0 16	1 08
50	17 39	19 27	23 32	24 31	0 31	1 24
52	17 38	19 31	23 50	24 51	0 51	1 44
54	17 36	19 34	23 58	25 00	1 00	1 54
56	17 35	19 40	24 07	0 07	1 10	2 04
58	17 33	19 45	24 18	0 18	1 22	2 16
60	17 31	19 51	24 30	0 30	1 35	2 30
S			24 44	0 44	1 51	2 46

GMT	Equation of Time (App.—Mean) 9	10	11
h	m s	m s	m s
0	+ 2 33.4	+ 2 54.1	+ 3 15.0
6	+ 2 38.6	+ 2 59.3	+ 3 20.2
12	+ 2 43.7	+ 3 04.5	+ 3 25.4
18	+ 2 48.9	+ 3 09.7	+ 3 30.7
24	+ 2 54.1	+ 3 15.0	+ 3 35.9

DAY	GMT of Transit Meridian of Greenwich Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
9	15 54	8 58	0 16	11 45	16 28
10	16 46	8 58	0 11	11 42	16 24
11	17 36	8 58	0 06	11 39	16 21
12	18 26	8 59	0 01	11 36	16 17

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.2	0.2	0.4
30	0.2	0.1	0.3
45	0.2	0.1	0.2
60	0.2	0.1	0.1
75	0.2	0.0	0.1
90			

Moon's Lower Limb Add

Alt.	9	10	11
°	′	′	′
0	15.2	14.2	13.3
4	15.2	14.2	13.3
8	15.2	14.2	13.3
12	15.2	14.2	13.3
16	15.2	14.2	13.3
20	15.2	14.2	13.4
24	15.2	14.3	13.4
28	15.2	14.3	13.5
32	15.2	14.3	13.6
36	15.2	14.4	13.6
40	15.2	14.4	13.7
44	15.3	14.5	13.8
48	15.3	14.5	13.9
52	15.3	14.6	14.0
56	15.3	14.7	14.1
60	15.3	14.7	14.2
64	15.3	14.8	14.3
68	15.4	14.9	14.4
72	15.4	14.9	14.6
76	15.4	15.0	14.7
80	15.4	15.1	14.8
84	15.4	15.2	14.9
88	15.5	15.2	15.0
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	9	10	11
°	′	′	′
0	15.8	16.4	16.9
4	15.8	16.3	16.8
8	15.8	16.3	16.8
12	15.8	16.3	16.8
16	15.8	16.3	16.8
20	15.7	16.3	16.7
24	15.7	16.2	16.7
28	15.7	16.2	16.6
32	15.7	16.2	16.6
36	15.7	16.1	16.5
40	15.7	16.1	16.4
44	15.7	16.0	16.3
48	15.7	16.0	16.2
52	15.6	15.9	16.1
56	15.6	15.8	16.0
60	15.6	15.8	15.9
64	15.6	15.7	15.8
68	15.6	15.6	15.7
72	15.6	15.6	15.6
76	15.5	15.5	15.4
80	15.5	15.4	15.3
84	15.5	15.3	15.2
88	15.5	15.3	15.1
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.9 GHA	VENUS −3.9 Dec.	MARS −2.6 GHA	MARS −2.6 Dec.	JUPITER −1.2 GHA	JUPITER −1.2 Dec.	SATURN 0.8 GHA	SATURN 0.8 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
12 0	350 58.4	225 24.3	+17 34.0	359 49.4	−10 12.4	185 38.2	+ 7 19.5	115 10.0	−17 49.8	92 41.7	108	−21 30.9	+ 2
1	6 00.8	240 24.1	33.6	14 52.6	12.6	200 40.1	19.3	130 12.3	49.9	107 11.5	109	21 30.7	+ 3
2	21 03.3	255 23.9	33.2	29 55.7	12.7	215 42.1	19.1	145 14.6	49.9	121 41.4	109	21 30.4	+ 3
3	36 05.8	270 23.6	·· 32.8	44 58.9	·· 12.9	230 44.0	·· 18.9	160 16.9	·· 50.0	136 11.3	109	·21 30.1	+ 5
4	51 08.2	285 23.4	32.4	60 02.0	13.1	245 46.0	18.7	175 19.2	50.0	150 41.2	109	21 29.6	+ 6
5	66 10.7	300 23.2	32.0	75 05.1	13.2	260 48.0	18.5	190 21.5	50.1	165 11.1	110	21 29.0	+ 7
6	81 13.2	315 22.9	+17 31.7	90 08.3	−10 13.4	275 49.9	+ 7 18.3	205 23.8	−17 50.1	179 41.1	110	−21 28.3	+ 8
7	96 15.6	330 22.7	31.3	105 11.4	13.5	290 51.9	18.1	220 26.1	50.2	194 11.1	110	21 27.5	+ 9
8	111 18.1	345 22.5	30.9	120 14.6	13.7	305 53.8	17.9	235 28.4	50.2	208 41.1	111	21 26.6	+ 10
9	126 20.6	0 22.2	·· 30.5	135 17.7	·· 13.9	320 55.8	·· 17.7	250 30.7	·· 50.3	223 11.2	111	·21 25.6	+ 11
10	141 23.0	15 22.0	30.1	150 20.9	14.0	335 57.8	17.5	265 33.0	50.3	237 41.3	111	21 24.5	+ 12
11	156 25.5	30 21.8	29.7	165 24.0	14.2	350 59.7	17.3	280 35.3	50.3	252 11.4	112	21 23.3	+ 13
12	171 27.9	45 21.5	+17 29.3	180 27.2	−10 14.3	6 01.7	+ 7 17.1	295 37.6	−17 50.4	266 41.6	112	−21 22.0	+ 14
13	186 30.4	60 21.3	28.9	195 30.3	14.5	21 03.6	16.9	310 39.9	50.4	281 11.8	112	21 20.6	+ 15
14	201 32.9	75 21.1	28.5	210 33.5	14.7	36 05.6	16.6	325 42.2	50.5	295 42.0	112	21 19.1	+ 16
15	216 35.3	90 20.8	·· 28.1	225 36.6	·· 14.8	51 07.6	·· 16.4	340 44.5	·· 50.5	310 12.2	113	·21 17.5	+ 17
16	231 37.8	105 20.6	27.7	240 39.8	15.0	66 09.5	16.2	355 46.8	50.6	324 42.5	113	21 15.8	+ 18
17	246 40.3	120 20.4	27.3	255 42.9	15.1	81 11.5	16.0	10 49.1	50.6	339 12.8	114	21 14.0	+ 19
18	261 42.7	135 20.1	+17 26.9	270 46.1	−10 15.3	96 13.4	+ 7 15.8	25 51.3	−17 50.7	353 43.2	114	−21 12.1	+ 20
19	276 45.2	150 19.9	26.5	285 49.2	15.4	111 15.4	15.6	40 53.6	50.7	8 13.6	114	21 10.1	+ 21
20	291 47.7	165 19.7	26.1	300 52.4	15.6	126 17.4	15.4	55 55.9	50.8	22 44.0	114	21 08.0	+ 23
21	306 50.1	180 19.4	·· 25.7	315 55.5	·· 15.8	141 19.3	·· 15.2	70 58.2	·· 50.8	37 14.4	115	·21 05.7	+ 23
22	321 52.6	195 19.2	25.3	330 58.6	15.9	156 21.3	15.0	86 00.5	50.8	51 44.9	115	21 03.4	+ 24
23	336 55.1	210 19.0	24.9	346 01.8	16.1	171 23.2	14.8	101 02.8	50.9	66 15.4	115	21 01.0	+ 25
13 0	351 57.5	225 18.7	+17 24.5	1 04.9	−10 16.2	186 25.2	+ 7 14.6	116 05.1	−17 50.9	80 45.9	116	−20 58.5	+ 26
1	7 00.0	240 18.5	24.1	16 08.1	16.4	201 27.2	14.4	131 07.4	51.0	95 16.5	116	20 55.9	+ 27
2	22 02.4	255 18.3	23.7	31 11.2	16.5	216 29.1	14.2	146 09.7	51.0	109 47.1	117	20 53.2	+ 28
3	37 04.9	270 18.0	·· 23.3	46 14.4	·· 16.7	231 31.1	·· 14.0	161 12.0	·· 51.1	124 17.8	117	·20 50.4	+ 29
4	52 07.4	285 17.8	22.9	61 17.5	16.8	246 33.1	13.8	176 14.3	51.1	138 48.5	117	20 47.5	+ 30
5	67 09.8	300 17.5	22.5	76 20.7	17.0	261 35.0	13.6	191 16.6	51.2	153 19.2	118	20 44.5	+ 30
6	82 12.3	315 17.3	+17 22.1	91 23.8	−10 17.1	276 37.0	+ 7 13.4	206 18.9	−17 51.2	167 50.0	117	−20 41.5	+ 32
7	97 14.8	330 17.1	21.7	106 27.0	17.3	291 38.9	13.2	221 21.2	51.3	182 20.7	119	20 38.3	+ 33
8	112 17.2	345 16.8	21.2	121 30.1	17.4	306 40.9	12.9	236 23.5	51.3	196 51.6	118	20 35.0	+ 34
9	127 19.7	0 16.6	·· 20.8	136 33.3	·· 17.6	321 42.9	·· 12.7	251 25.8	·· 51.4	211 22.4	119	·20 31.6	+ 34
10	142 22.2	15 16.3	20.4	151 36.4	17.7	336 44.8	12.5	266 28.1	51.4	225 53.3	120	20 28.2	+ 36
11	157 24.6	30 16.1	20.0	166 39.5	17.9	351 46.8	12.3	281 30.3	51.4	240 24.3	119	20 24.6	+ 36
12	172 27.1	45 15.9	+17 19.6	181 42.7	−10 18.0	6 48.7	+ 7 12.1	296 32.6	−17 51.5	254 55.2	121	−20 21.0	+ 38
13	187 29.5	60 15.6	19.2	196 45.8	18.2	21 50.7	11.9	311 34.9	51.5	269 26.3	120	20 17.2	+ 38
14	202 32.0	75 15.4	18.8	211 49.0	18.3	36 52.7	11.7	326 37.2	51.6	283 57.3	121	20 13.4	+ 39
15	217 34.5	90 15.1	·· 18.4	226 52.1	·· 18.5	51 54.6	·· 11.5	341 39.5	·· 51.6	298 28.4	121	·20 09.5	+ 40
16	232 36.9	105 14.9	17.9	241 55.3	18.6	66 56.6	11.3	356 41.8	51.7	312 59.5	122	20 05.5	+ 41
17	247 39.4	120 14.6	17.5	256 58.4	18.8	81 58.5	11.1	11 44.1	51.7	327 30.7	122	20 01.4	+ 42
18	262 41.9	135 14.4	+17 17.1	272 01.5	−10 18.9	97 00.5	+ 7 10.9	26 46.4	−17 51.8	342 01.9	122	−19 57.2	+ 43
19	277 44.3	150 14.2	16.7	287 04.7	19.1	112 02.5	10.7	41 48.7	51.8	356 33.1	123	19 52.9	+ 44
20	292 46.8	165 13.9	16.3	302 07.8	19.2	127 04.4	10.5	56 51.0	51.9	11 04.4	123	19 48.5	+ 45
21	307 49.3	180 13.7	·· 15.8	317 11.0	·· 19.4	142 06.4	·· 10.3	71 53.3	·· 51.9	25 35.7	123	·19 44.0	+ 45
22	322 51.7	195 13.4	15.4	332 14.1	19.5	157 08.3	10.1	86 55.6	52.0	40 07.0	124	19 39.5	+ 46
23	337 54.2	210 13.2	15.0	347 17.2	19.7	172 10.3	09.9	101 57.9	52.0	54 38.4	124	19 34.9	+ 48
14 0	352 56.7	225 12.9	+17 14.6	2 20.4	−10 19.8	187 12.3	+ 7 09.7	117 00.1	−17 52.1	69 09.8	125	−19 30.1	+ 48
1	7 59.1	240 12.7	14.1	17 23.5	20.0	202 14.2	09.4	132 02.4	52.1	83 41.3	125	19 25.3	+ 49
2	23 01.6	255 12.4	13.7	32 26.7	20.1	217 16.2	09.2	147 04.7	52.1	98 12.8	125	19 20.4	+ 50
3	38 04.0	270 12.2	·· 13.3	47 29.8	·· 20.2	232 18.2	·· 09.0	162 07.0	·· 52.2	112 44.3	126	·19 15.4	+ 50
4	53 06.5	285 12.0	12.9	62 33.0	20.4	247 20.1	08.8	177 09.3	52.2	127 15.9	126	19 10.4	+ 52
5	68 09.0	300 11.7	12.4	77 36.1	20.5	262 22.1	08.6	192 11.6	52.3	141 47.5	126	19 05.2	+ 52
6	83 11.4	315 11.5	+17 12.0	92 39.2	−10 20.7	277 24.0	+ 7 08.4	207 13.9	−17 52.3	156 19.1	127	−19 00.0	+ 54
7	98 13.9	330 11.2	11.6	107 42.4	20.8	292 26.0	08.2	222 16.2	52.4	170 50.8	127	18 54.6	+ 54
8	113 16.4	345 11.0	11.1	122 45.5	21.0	307 28.0	08.0	237 18.5	52.4	185 22.5	128	18 49.2	+ 55
9	128 18.8	0 10.7	·· 10.7	137 48.7	·· 21.1	322 29.9	·· 07.8	252 20.8	·· 52.5	199 54.3	128	·18 43.7	+ 55
10	143 21.3	15 10.5	10.3	152 51.8	21.2	337 31.9	07.6	267 23.1	52.5	214 26.1	128	18 38.2	+ 57
11	158 23.8	30 10.2	09.8	167 54.9	21.4	352 33.8	07.4	282 25.3	52.6	228 57.9	129	18 32.5	+ 57
12	173 26.2	45 10.0	+17 09.4	182 58.1	−10 21.5	7 35.8	+ 7 07.2	297 27.6	−17 52.6	243 29.8	129	−18 26.8	+ 59
13	188 28.7	60 09.7	09.0	198 01.2	21.7	22 37.8	07.0	312 29.9	52.7	258 01.7	129	18 20.9	+ 59
14	203 31.2	75 09.5	08.5	213 04.3	21.8	37 39.7	06.8	327 32.2	52.7	272 33.6	130	18 15.0	+ 59
15	218 33.6	90 09.2	·· 08.1	228 07.5	·· 21.9	52 41.7	·· 06.6	342 34.5	·· 52.8	287 05.6	130	·18 09.1	+ 61
16	233 36.1	105 09.0	07.7	243 10.6	22.1	67 43.6	06.4	357 36.8	52.8	301 37.6	130	18 03.0	+ 61
17	248 38.5	120 08.7	07.2	258 13.8	22.2	82 45.6	06.2	12 39.1	52.8	316 09.6	131	17 56.9	+ 62
18	263 41.0	135 08.5	+17 06.8	273 16.9	−10 22.4	97 47.6	+ 7 05.9	27 41.4	−17 52.9	330 41.7	132	−17 50.7	+ 63
19	278 43.5	150 08.2	06.4	288 20.0	22.5	112 49.5	05.7	42 43.7	52.9	345 13.9	131	17 44.4	+ 64
20	293 45.9	165 08.0	05.9	303 23.2	22.6	127 51.5	05.5	57 45.9	53.0	359 46.0	132	17 38.0	+ 64
21	308 48.4	180 07.7	·· 05.5	318 26.3	·· 22.8	142 53.5	·· 05.3	72 48.2	·· 53.0	14 18.2	133	·17 31.6	+ 66
22	323 50.9	195 07.5	05.0	333 29.4	22.9	157 55.4	05.1	87 50.5	53.1	28 50.5	132	17 25.0	+ 66
23	338 53.3	210 07.2	04.6	348 32.6	23.0	172 57.4	04.9	102 52.8	53.1	43 22.7	133	17 18.4	+ 66
24	353 55.8	225 07.0	+17 04.1	3 35.7	−10 23.2	187 59.3	+ 7 04.7	117 55.1	−17 53.2	57 55.0	134	−17 11.8	+ 68
code	—	− 3	− 4	+ 31	− 2	+ 20	− 2	+ 23	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
12 0	180 54.1	+ 4 16.5
1	195 54.3	15.6
2	210 54.5	14.6
3	225 54.8	·· 13.7
4	240 55.0	12.7
5	255 55.2	11.8
6	270 55.4	+ 4 10.8
7	285 55.6	09.8
8	300 55.8	08.9
9	315 56.1	·· 07.9
10	330 56.3	07.0
11	345 56.5	06.0
12	0 56.7	+ 4 05.1
13	15 56.9	04.1
14	30 57.2	03.2
15	45 57.4	·· 02.2
16	60 57.6	01.2
17	75 57.8	4 00.3
18	90 58.0	+ 3 59.3
19	105 58.3	58.4
20	120 58.5	57.4
21	135 58.7	·· 56.5
22	150 58.9	55.5
23	165 59.2	54.6
13 0	180 59.4	+ 3 53.6
1	195 59.6	52.6
2	210 59.8	51.7
3	226 00.0	·· 50.7
4	241 00.3	49.8
5	256 00.5	48.8
6	271 00.7	+ 3 47.9
7	286 00.9	46.9
8	301 01.1	45.9
9	316 01.4	·· 45.0
10	331 01.6	44.0
11	346 01.8	43.1
12	1 02.0	+ 3 42.1
13	16 02.2	41.2
14	31 02.5	40.2
15	46 02.7	·· 39.2
16	61 02.9	38.3
17	76 03.1	37.3
18	91 03.3	+ 3 36.4
19	106 03.6	35.4
20	121 03.8	34.4
21	136 04.0	·· 33.5
22	151 04.2	32.5
23	166 04.4	31.6
14 0	181 04.7	+ 3 30.6
1	196 04.9	29.7
2	211 05.1	28.7
3	226 05.3	·· 27.7
4	241 05.6	26.8
5	256 05.8	25.8
6	271 06.0	+ 3 24.9
7	286 06.2	23.9
8	301 06.4	22.9
9	316 06.7	·· 22.0
10	331 06.9	21.0
11	346 07.1	20.1
12	1 07.3	+ 3 19.1
13	16 07.6	18.1
14	31 07.8	17.2
15	46 08.0	·· 16.2
16	61 08.2	15.3
17	76 08.4	14.3
18	91 08.7	+ 3 13.3
19	106 08.9	12.4
20	121 09.1	11.4
21	136 09.3	·· 10.4
22	151 09.5	09.5
23	166 09.8	08.5
24	181 10.0	+ 3 07.6
code	—	− 9

STARS No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 50.3	−40 28.3
5	Achernar	335 57.9	−57 27.1
30	Acrux	173 57.6	−62 51.7
19	Adhara	255 46.1	−28 54.5
10	Aldebaran	291 38.2	+16 25.5
32	Alioth	166 58.5	+56 11.8
34	Alkaid	153 32.7	+49 31.9
55	Al Na'ir	28 36.6	−47 10.2
15	Alnilam	276 29.6	− 1 13.6
25	Alphard	218 38.2	− 8 28.2
41	Alphecca	126 47.2	+26 51.8
1	Alpheratz	358 27.2	+28 51.3
51	Altair	62 49.5	+ 8 45.4
2	Ankaa	353 57.2	−42 32.2
42	Antares	113 18.6	−26 20.3
37	Arcturus	146 34.8	+19 24.6
43	Atria	108 58.7	−68 57.3
22	Avior	234 35.9	−59 22.0
13	Bellatrix	279 17.7	+ 6 18.8
16	Betelg'se	271 47.4	+ 7 24.1
17	Canopus	264 15.2	−52 40.0
12	Capella	281 37.3	+45 57.2
53	Deneb	50 00.1	+45 07.8
28	Denebola	183 17.3	+14 48.9
4	Diphda	349 38.2	−18 13.2
27	Dubhe	194 44.4	+61 59.0
14	Elnath	279 06.4	+28 34.3
47	Eltanin	91 05.8	+51 30.0
54	Enif	34 28.6	+ 9 40.8
56	Fomalhaut	16 10.5	−29 50.9
31	Gacrux	172 48.9	−56 52.4
29	Gienah	176 36.4	−17 18.1
35	Hadar	149 48.8	−60 10.1
6	Hamal	328 48.6	+23 15.6
48	Kaus Aust.	84 40.1	−34 24.4
40	Kochab	137 18.8	+74 20.2
57	Markab	14 20.4	+14 58.6
8	Menkar	314 59.4	+ 3 55.4
36	Menkent	148 58.1	−36 09.5
24	Miapl'dus	221 49.6	−69 32.2
9	Mirfak	309 41.1	+49 42.4
50	Nunki	76 50.9	−26 21.1
52	Peacock	54 25.8	−56 52.5
21	Pollux	244 19.9	+28 07.8
20	Procyon	245 44.4	+ 5 20.3
46	R'alhague	96 45.9	+12 35.7
26	Regulus	208 29.1	+12 10.8
11	Rigel	281 52.9	− 8 14.9
38	Rigil Kent.	140 50.4	−60 39.7
44	Sabik	103 01.4	−15 40.3
3	Schedar	350 28.6	+56 18.1
45	Shaula	97 19.7	−37 04.5
18	Sirius	259 11.3	−16 39.2
33	Spica	159 16.4	−10 56.1
23	Suhail	223 24.1	−43 15.3
49	Vega	81 07.6	+38 44.9
39	Zub'g'bi	137 52.8	−15 51.8

Lat. N °	Sunrise h m	Twlt. begins h m	Moonrise 12 h m	13 h m	14 h m	15 h m
72	4 58	////	▬	▬	19 24	18 25
70	5 04	////	▬	19 01	18 08	17 52
68	5 09	0 19	17 24	17 30	17 30	17 29
66	5 14	1 29	16 27	16 51	17 03	17 10
64	5 17	2 03	15 54	16 24	16 43	16 55
62	5 20	2 27	15 30	16 03	16 26	16 42
60	5 23	2 45	15 10	15 46	16 12	16 32
58	5 25	2 59	14 54	15 32	16 00	16 22
56	5 27	3 11	14 41	15 19	15 50	16 14
54	5 29	3 22	14 29	15 09	15 41	16 07
52	5 31	3 30	14 18	14 59	15 32	16 00
50	5 33	3 38	14 09	14 50	15 25	15 54
45	5 36	3 54	13 49	14 32	15 09	15 41
40	5 39	4 06	13 33	14 17	14 56	15 30
35	5 41	4 15	13 20	14 05	14 45	15 21
30	5 43	4 22	13 08	13 54	14 35	15 13
20	5 47	4 33	12 48	13 35	14 18	14 59
10	5 50	4 40	12 30	13 18	14 04	14 47
0	5 53	4 44	12 14	13 03	13 50	14 35
10	5 55	4 46	11 58	12 47	13 36	14 24
20	5 58	4 46	11 40	12 31	13 21	14 12
30	6 01	4 43	11 20	12 12	13 04	13 58
35	6 02	4 40	11 08	12 01	12 55	13 49
40	6 04	4 36	10 55	11 48	12 43	13 40
45	6 06	4 30	10 39	11 33	12 30	13 29
50	6 09	4 23	10 19	11 14	12 14	13 16
52	6 10	4 19	10 10	11 06	12 06	13 09
54	6 11	4 15	9 59	10 56	11 57	13 02
56	6 12	4 10	9 48	10 45	11 48	12 55
58	6 14	4 04	9 34	10 32	11 37	12 46
60	6 15	3 58	9 18	10 17	11 24	12 36

Lat. N °	Sunset h m	Twlt. ends h m	Moonset 12 h m	13 h m	14 h m	15 h m
72	18 51	////	▬	▬	20 50	23 23
70	18 45	////	▬	19 34	22 04	23 54
68	18 40	23 07	19 31	21 05	22 42	24 17
66	18 36	22 12	20 27	21 44	23 08	24 34
64	18 33	21 41	21 00	22 10	23 28	24 49
62	18 30	21 19	21 25	22 31	23 44	25 01
60	18 27	21 02	21 44	22 48	23 58	25 11
58	18 25	20 48	22 00	23 02	24 09	0 09
56	18 23	20 37	22 13	23 14	24 19	0 19
54	18 21	20 26	22 25	23 24	24 28	0 28
52	18 20	20 19	22 35	23 34	24 36	0 36
50	18 18	20 11	22 45	23 42	24 43	0 43
45	18 15	19 56	23 04	24 00	0 00	0 58
40	18 12	19 44	23 20	24 14	0 14	1 10
35	18 10	19 36	23 33	24 26	0 26	1 21
30	18 08	19 28	23 45	24 37	0 37	1 30
20	18 05	19 19	24 05	0 05	0 55	1 46
10	18 02	19 12	24 22	0 22	1 11	1 59
0	17 59	19 08	24 38	0 38	1 26	2 12
10	17 57	19 07	0 05	0 54	1 40	2 25
20	17 54	19 07	0 23	1 11	1 56	2 38
30	17 51	19 11	0 43	1 30	2 14	2 54
35	17 50	19 14	0 55	1 42	2 24	3 02
40	17 48	19 18	1 08	1 55	2 36	3 13
45	17 46	19 24	1 24	2 10	2 50	3 24
50	17 44	19 32	1 44	2 29	3 07	3 39
52	17 43	19 36	1 54	2 38	3 15	3 45
54	17 42	19 41	2 04	2 48	3 24	3 53
56	17 40	19 45	2 16	2 59	3 34	4 01
58	17 39	19 52	2 30	3 12	3 45	4 10
60	17 38	19 59	2 46	3 27	3 58	4 21

GMT h	Equation of Time (App. − Mean) 12 m s	13 m s	14 m s
0	+ 3 35.9	+ 3 57.0	+ 4 18.2
6	+ 3 41.2	+ 4 02.3	+ 4 23.6
12	+ 3 46.5	+ 4 07.6	+ 4 28.9
18	+ 3 51.8	+ 4 12.9	+ 4 34.2
24	+ 3 57.0	+ 4 18.2	+ 4 39.5

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
12	18 26	8 59	{0 01 / 23 56}	11 36	16 17
13	19 14	8 59	23 51	11 33	16 13
14	20 01	8 59	23 46	11 30	16 10
15	20 46	9 00	23 41	11 27	16 06

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.2	0.2	0.4
30	0.2	0.1	0.3
45	0.2	0.1	0.2
60	0.2	0.1	0.1
75	0.2	0.0	0.1
90			

Moon's Lower Limb Add

Alt. °	12 ′	13 ′	14 ′
0	12.6	12.2	12.0
4	12.6	12.3	12.0
8	12.7	12.3	12.0
12	12.7	12.3	12.1
16	12.7	12.4	12.1
20	12.8	12.4	12.2
24	12.9	12.5	12.3
28	12.9	12.6	12.4
32	13.0	12.7	12.5
36	13.1	12.8	12.6
40	13.2	12.9	12.7
44	13.3	13.0	12.8
48	13.4	13.2	13.0
52	13.6	13.3	13.1
56	13.7	13.5	13.3
60	13.8	13.6	13.5
64	14.0	13.8	13.6
68	14.1	14.0	13.8
72	14.3	14.1	14.0
76	14.4	14.3	14.2
80	14.6	14.5	14.4
84	14.8	14.7	14.6
88	14.9	14.8	14.7
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt. °	12 ′	13 ′	14 ′
0	17.2	17.4	17.6
4	17.2	17.4	17.6
8	17.2	17.4	17.5
12	17.2	17.4	17.5
16	17.1	17.3	17.5
20	17.1	17.3	17.4
24	17.0	17.2	17.3
28	16.9	17.1	17.2
32	16.8	17.0	17.1
36	16.7	16.9	17.0
40	16.6	16.8	16.9
44	16.5	16.6	16.7
48	16.4	16.5	16.6
52	16.3	16.4	16.4
56	16.1	16.2	16.3
60	16.0	16.1	16.1
64	15.9	15.9	15.9
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.2
84	15.1	15.0	15.0
88	15.0	14.9	14.8
90			

Subtract from table, back cover

First Quarter 12

GMT	♈ GHA	VENUS −3.8 GHA	VENUS −3.8 Dec.	MARS −2.6 GHA	MARS −2.6 Dec.	JUPITER −1.2 GHA	JUPITER −1.2 Dec.	SATURN 0.8 GHA	SATURN 0.8 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
15 0	353 55.8	225 07.0	+17 04.1	3 35.7	−10 23.2	187 59.3	+ 7 04.7	117 55.1	−17 53.2	57 55.0	134	−17 11.8	+ 68
1	8 58.3	240 06.7	03.7	18 38.9	23.3	203 01.3	04.5	132 57.4	53.2	72 27.4	133	17 05.0	+ 68
2	24 00.7	255 06.5	03.3	33 42.0	23.5	218 03.3	04.3	147 59.7	53.3	86 59.7	135	16 58.2	+ 69
3	39 03.2	270 06.2	02.8	48 45.1	23.6	233 05.2	04.1	163 02.0	53.3	101 32.2	134	16 51.3	+ 70
4	54 05.6	285 06.0	02.4	63 48.3	23.7	248 07.2	03.9	178 04.2	53.4	116 04.6	135	16 44.3	+ 70
5	69 08.1	300 05.7	01.9	78 51.4	23.9	263 09.2	03.7	193 06.5	53.4	130 37.1	135	16 37.3	+ 71
6	84 10.6	315 05.4	+17 01.5	93 54.5	−10 24.0	278 11.1	+ 7 03.5	208 08.8	−17 53.5	145 09.6	135	−16 30.2	+ 72
7	99 13.0	330 05.2	01.0	108 57.7	24.1	293 13.1	03.3	223 11.1	53.5	159 42.1	136	16 23.0	+ 73
8	114 15.5	345 04.9	00.6	124 00.8	24.3	308 15.0	03.1	238 13.4	53.6	174 14.7	136	16 15.7	+ 73
9	129 18.0	0 04.7	−17 00.1	139 03.9	24.4	323 17.0	02.9	253 15.7	53.6	188 47.3	137	−16 08.4	+ 74
10	144 20.4	15 04.4	16 59.7	154 07.1	24.5	338 19.0	02.7	268 18.0	53.7	203 20.0	137	16 01.0	+ 75
11	159 22.9	30 04.2	59.2	169 10.2	24.6	353 20.9	02.4	283 20.3	53.7	217 52.7	137	15 53.5	+ 75
12	174 25.4	45 03.9	+16 58.8	184 13.3	−10 24.8	8 22.9	+ 7 02.2	298 22.5	−17 53.7	232 25.4	137	−15 46.0	+ 76
13	189 27.8	60 03.7	58.3	199 16.5	24.9	23 24.9	02.0	313 24.8	53.8	246 58.1	138	15 38.4	+ 77
14	204 30.3	75 03.4	57.8	214 19.6	25.0	38 26.8	01.8	328 27.1	53.8	261 30.9	138	15 30.7	+ 77
15	219 32.8	90 03.1	57.4	229 22.7	25.2	53 28.8	01.6	343 29.4	53.9	276 03.7	139	−15 23.0	+ 78
16	234 35.2	105 02.9	56.9	244 25.8	25.3	68 30.7	01.4	358 31.7	53.9	290 36.6	138	15 15.2	+ 79
17	249 37.7	120 02.6	56.5	259 29.0	25.4	83 32.7	01.2	13 34.0	54.0	305 09.4	140	15 07.3	+ 79
18	264 40.1	135 02.4	+16 56.0	274 32.1	−10 25.5	98 34.7	+ 7 01.0	28 36.3	−17 54.0	319 42.4	139	−14 59.4	+ 80
19	279 42.6	150 02.1	55.5	289 35.2	25.7	113 36.6	00.8	43 38.5	54.1	334 15.3	140	14 51.4	+ 81
20	294 45.1	165 01.9	55.1	304 38.4	25.8	128 38.6	00.6	58 40.8	54.1	348 48.3	140	14 43.3	+ 81
21	309 47.5	180 01.6	54.6	319 41.5	25.9	143 40.5	00.4	73 43.1	54.2	3 21.3	140	−14 35.2	+ 82
22	324 50.0	195 01.3	54.2	334 44.6	26.1	158 42.5	00.2	88 45.4	54.2	17 54.3	140	14 27.0	+ 82
23	339 52.5	210 01.1	53.7	349 47.7	26.2	173 44.5	7 00.0	103 47.7	54.3	32 27.3	141	14 18.8	+ 83
16 0	354 54.9	225 00.8	+16 53.2	4 50.9	−10 26.3	188 46.4	+ 6 59.8	118 50.0	−17 54.3	47 00.4	141	−14 10.5	+ 84
1	9 57.4	240 00.6	52.8	19 54.0	26.4	203 48.4	59.6	133 52.3	54.4	61 33.5	142	14 02.1	+ 85
2	24 59.9	255 00.3	52.3	34 57.1	26.6	218 50.4	59.4	148 54.5	54.4	76 06.7	141	13 53.6	+ 85
3	40 02.3	270 00.0	51.8	50 00.3	26.7	233 52.3	59.2	163 56.8	54.5	90 39.8	142	−13 45.1	+ 85
4	55 04.8	284 59.8	51.4	65 03.4	26.8	248 54.3	59.0	178 59.1	54.5	105 13.0	142	13 36.6	+ 86
5	70 07.3	299 59.5	50.9	80 06.5	26.9	263 56.2	58.7	194 01.4	54.6	119 46.2	143	13 28.0	+ 87
6	85 09.7	314 59.3	+16 50.4	95 09.6	−10 27.0	278 58.2	+ 6 58.5	209 03.7	−17 54.6	134 19.5	143	−13 19.3	+ 87
7	100 12.2	329 59.0	50.0	110 12.8	27.2	294 00.2	58.3	224 06.0	54.7	148 52.8	143	13 10.6	+ 88
8	115 14.6	344 58.7	49.5	125 15.9	27.3	309 02.1	58.1	239 08.2	54.7	163 26.1	143	13 01.8	+ 89
9	130 17.1	359 58.5	49.0	140 19.0	27.4	324 04.1	57.9	254 10.5	54.7	177 59.4	143	−12 52.9	+ 89
10	145 19.6	14 58.2	48.6	155 22.1	27.5	339 06.1	57.7	269 12.8	54.8	192 32.7	144	12 44.0	+ 89
11	160 22.0	29 57.9	48.1	170 25.3	27.7	354 08.0	57.5	284 15.1	54.8	207 06.1	144	12 35.1	+ 90
12	175 24.5	44 57.7	+16 47.6	185 28.4	−10 27.8	9 10.0	+ 6 57.3	299 17.4	−17 54.9	221 39.5	144	−12 26.1	+ 91
13	190 27.0	59 57.4	47.1	200 31.5	27.9	24 11.9	57.1	314 19.7	54.9	236 12.9	145	12 17.0	+ 91
14	205 29.4	74 57.2	46.7	215 34.6	28.0	39 13.9	56.9	329 21.9	55.0	250 46.4	144	12 07.9	+ 92
15	220 31.9	89 56.9	46.2	230 37.7	28.1	54 15.9	56.7	344 24.2	55.0	265 19.8	145	−11 58.7	+ 92
16	235 34.4	104 56.6	45.7	245 40.9	28.2	69 17.8	56.5	359 26.5	55.1	279 53.3	145	11 49.5	+ 93
17	250 36.8	119 56.4	45.2	260 44.0	28.4	84 19.8	56.3	14 28.8	55.1	294 26.8	146	11 40.2	+ 93
18	265 39.3	134 56.1	+16 44.7	275 47.1	−10 28.5	99 21.8	+ 6 56.1	29 31.1	−17 55.2	309 00.4	145	−11 30.9	+ 94
19	280 41.7	149 55.8	44.3	290 50.2	28.6	114 23.7	55.9	44 33.4	55.2	323 33.9	146	11 21.5	+ 95
20	295 44.2	164 55.6	43.8	305 53.3	28.7	129 25.7	55.7	59 35.6	55.3	338 07.5	146	11 12.0	+ 94
21	310 46.7	179 55.3	43.3	320 56.5	28.8	144 27.7	55.5	74 37.9	55.3	352 41.1	146	−11 02.6	+ 96
22	325 49.1	194 55.0	42.8	335 59.6	28.9	159 29.6	55.3	89 40.2	55.4	7 14.7	146	10 53.0	+ 96
23	340 51.6	209 54.8	42.3	351 02.7	29.1	174 31.6	55.0	104 42.5	55.4	21 48.3	147	10 43.4	+ 96
17 0	355 54.1	224 54.5	+16 41.9	6 05.8	−10 29.2	189 33.5	+ 6 54.8	119 44.8	−17 55.5	36 22.0	146	−10 33.8	+ 97
1	10 56.5	239 54.2	41.4	21 08.9	29.3	204 35.5	54.6	134 47.0	55.5	50 55.6	147	10 24.1	+ 97
2	25 59.0	254 54.0	40.9	36 12.0	29.4	219 37.5	54.4	149 49.3	55.6	65 29.3	147	10 14.4	+ 98
3	41 01.5	269 53.7	40.4	51 15.2	29.5	234 39.4	54.2	164 51.6	55.6	80 03.0	147	−10 04.6	+ 98
4	56 03.9	284 53.4	39.9	66 18.3	29.6	249 41.4	54.0	179 53.9	55.7	94 36.7	147	9 54.8	+ 98
5	71 06.4	299 53.2	39.4	81 21.4	29.7	264 43.4	53.8	194 56.2	55.7	109 10.4	148	9 45.0	+ 99
6	86 08.9	314 52.9	+16 38.9	96 24.5	−10 29.9	279 45.3	+ 6 53.6	209 58.4	−17 55.8	123 44.2	147	− 9 35.1	+100
7	101 11.3	329 52.6	38.4	111 27.6	30.0	294 47.3	53.4	225 00.7	55.8	138 17.9	148	9 25.1	+100
8	116 13.8	344 52.4	38.0	126 30.7	30.1	309 49.2	53.2	240 03.0	55.9	152 51.7	148	9 15.1	+100
9	131 16.2	359 52.1	37.5	141 33.9	30.2	324 51.2	53.0	255 05.3	55.9	167 25.5	148	− 9 05.1	+101
10	146 18.7	14 51.8	37.0	156 37.0	30.3	339 53.2	52.8	270 07.6	56.0	181 59.3	148	8 55.0	+101
11	161 21.2	29 51.6	36.5	171 40.1	30.4	354 55.1	52.6	285 09.8	56.0	196 33.1	148	8 44.9	+102
12	176 23.6	44 51.3	+16 36.0	186 43.2	−10 30.5	9 57.1	+ 6 52.4	300 12.1	−17 56.1	211 06.9	149	− 8 34.7	+102
13	191 26.1	59 51.0	35.5	201 46.3	30.6	24 59.1	52.2	315 14.4	56.1	225 40.8	148	8 24.5	+102
14	206 28.6	74 50.8	35.0	216 49.4	30.7	40 01.0	52.0	330 16.7	56.1	240 14.6	149	8 14.3	+103
15	221 31.0	89 50.5	34.5	231 52.5	30.8	55 03.0	51.8	345 19.0	56.2	254 48.5	148	− 8 04.0	+103
16	236 33.5	104 50.2	34.0	246 55.6	31.0	70 05.0	51.6	0 21.2	56.2	269 22.3	149	7 53.7	+103
17	251 36.0	119 50.0	33.5	261 58.7	31.1	85 06.9	51.3	15 23.5	56.3	283 56.2	149	7 43.4	+104
18	266 38.4	134 49.7	+16 33.0	277 01.9	−10 31.2	100 08.9	+ 6 51.1	30 25.8	−17 56.3	298 30.1	149	− 7 33.0	+104
19	281 40.9	149 49.4	32.5	292 05.0	31.3	115 10.8	50.9	45 28.1	56.4	313 04.0	149	7 22.6	+105
20	296 43.4	164 49.1	32.0	307 08.1	31.4	130 12.8	50.7	60 30.4	56.4	327 37.9	149	7 12.1	+105
21	311 45.8	179 48.9	31.5	322 11.2	31.5	145 14.8	50.5	75 32.6	56.5	342 11.8	149	− 7 01.6	+105
22	326 48.3	194 48.6	31.0	337 14.3	31.6	160 16.7	50.3	90 34.9	56.5	356 45.7	149	6 51.1	+106
23	341 50.7	209 48.3	30.5	352 17.4	31.7	175 18.7	50.1	105 37.2	56.6	11 19.6	149	6 40.5	+106
24	356 53.2	224 48.1	+16 30.0	7 20.5	−10 31.8	190 20.7	+ 6 49.9	120 39.5	−17 56.6	25 53.5	149	− 6 29.9	+106
corr	—	− 3	− 5	+ 31	− 1	+ 19	− 2	+ 23	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
15 00	181 10.0	+ 3 07.6	7	Acamar	315 50.3	−40 28.3
01	196 10.2	06.6	5	Achernar	335 57.8	−57 27.1
02	211 10.4	05.6	30	Acrux	173 57.6	−62 51.7
03	226 10.7	04.7	19	Adhara	255 46.1	−28 54.5
04	241 10.9	03.7	10	Aldebaran	291 38.1	+16 25.5
05	256 11.1	02.8				
06	271 11.3	+ 3 01.8	32	Alioth	166 58.5	+56 11.7
07	286 11.5	3 00.8	34	Alkaid	153 32.7	+49 31.9
08	301 11.8	2 59.9	55	Al Na'ir	28 36.6	−47 10.2
09	316 12.0	58.9	15	Alnilam	276 29.5	− 1 13.6
10	331 12.2	57.9	25	Alphard	218 38.1	− 8 28.2
11	346 12.4	57.0				
12	1 12.7	+ 2 56.0	41	Alphecca	126 47.2	+26 51.8
13	16 12.9	55.1	1	Alpheratz	358 27.2	+28 51.3
14	31 13.1	54.1	51	Altair	62 49.5	+ 8 45.4
15	46 13.3	53.1	2	Ankaa	353 57.2	−42 32.2
16	61 13.5	52.2	42	Antares	113 18.6	−26 20.3
17	76 13.8	51.2				
18	91 14.0	+ 2 50.2	37	Arcturus	146 34.8	+19 24.6
19	106 14.2	49.3	43	Atria	108 58.7	−68 57.3
20	121 14.4	48.3	22	Avior	234 35.9	−59 22.0
21	136 14.7	47.3	13	Bellatrix	279 17.6	+ 6 18.8
22	151 14.9	46.4	16	Betelg'se	271 47.4	+ 7 24.1
23	166 15.1	45.4				
			17	Canopus	264 15.2	−52 40.0
16 00	181 15.3	+ 2 44.5	12	Capella	281 37.3	+45 57.2
01	196 15.5	43.5	53	Deneb	50 00.2	+45 07.9
02	211 15.8	42.5	28	Denebola	183 17.3	+14 48.9
03	226 16.0	41.6	4	Diphda	349 38.2	−18 13.2
04	241 16.2	40.6				
05	256 16.4	39.6	27	Dubhe	194 44.4	+61 59.0
06	271 16.7	+ 2 38.7	14	Elnath	279 06.4	+28 34.3
07	286 16.9	37.7	47	Eltanin	91 05.9	+51 30.0
08	301 17.1	36.7	54	Enif	34 28.6	+ 9 40.8
09	316 17.3	35.8	56	Fomalhaut	16 10.5	−29 50.9
10	331 17.6	34.8				
11	346 17.8	33.8	31	Gacrux	172 48.9	−56 52.3
12	1 18.0	+ 2 32.9	29	Gienah	176 36.4	−17 18.1
13	16 18.2	31.9	35	Hadar	149 48.8	−60 10.1
14	31 18.4	31.0	6	Hamal	328 48.5	+23 15.6
15	46 18.7	30.0	48	Kaus Aust.	84 40.1	−34 24.4
16	61 18.9	29.0				
17	76 19.1	28.1	40	Kochab	137 18.8	+74 20.2
18	91 19.3	+ 2 27.1	57	Markab	14 20.4	+14 58.6
19	106 19.6	26.1	8	Menkar	314 59.4	+ 3 55.4
20	121 19.8	25.2	36	Menkent	148 58.1	−36 09.5
21	136 20.0	24.2	24	Miapl'dus	221 49.5	−69 32.2
22	151 20.2	23.2				
23	166 20.4	22.3	9	Mirfak	309 41.1	+49 42.4
			50	Nunki	76 50.9	−26 21.1
17 00	181 20.7	+ 2 21.3	52	Peacock	54 25.8	−56 52.6
01	196 20.9	20.3	21	Pollux	244 19.9	+28 07.8
02	211 21.1	19.4	20	Procyon	245 44.4	+ 5 20.3
03	226 21.3	18.4				
04	241 21.6	17.4	46	R'alhague	96 45.9	+12 35.7
05	256 21.8	16.5	26	Regulus	208 29.0	+12 10.8
06	271 22.0	+ 2 15.5	11	Rigel	281 52.9	− 8 14.9
07	286 22.2	14.5	38	Rigil Kent.	140 50.4	−60 39.7
08	301 22.5	13.6	44	Sabik	103 01.4	−15 40.3
09	316 22.7	12.6				
10	331 22.9	11.6	3	Schedar	350 28.6	+56 18.1
11	346 23.1	10.7	45	Shaula	97 19.7	−37 04.5
12	1 23.3	+ 2 09.7	18	Sirius	259 11.3	−16 39.2
13	16 23.6	08.7	33	Spica	159 16.4	−10 56.1
14	31 23.8	07.8	23	Suhail	223 24.1	−43 15.3
15	46 24.0	06.8				
16	61 24.2	05.8	49	Vega	81 07.7	+38 44.9
17	76 24.5	04.9	39	Zub'g'bi	137 52.8	−15 51.8
18	91 24.7	+ 2 03.9				
19	106 24.9	02.9				
20	121 25.1	02.0				
21	136 25.3	01.0				
22	151 25.6	2 00.0				
23	166 25.8	1 59.1				
24	181 26.0	+ 1 58.1				
code	−	− 10				

GMT	Equation of Time (App. − Mean) 15	16	17
h	m s	m s	m s
0	+ 4 39.5	+ 5 00.9	+ 5 22.2
6	+ 4 44.9	+ 5 06.2	+ 5 27.6
12	+ 4 50.2	+ 5 11.5	+ 5 32.9
18	+ 4 55.5	+ 5 16.9	+ 5 38.3
24	+ 5 00.9	+ 5 22.2	+ 5 43.6

Lat. N	Sunrise	Twlt. begins	Moonrise 15	16	17	18
°	h m	h m	h m	h m	h m	h m
72	5 12	////	18 25	18 01	17 44	17 29
70	5 16	////	17 52	17 42	17 33	17 25
68	5 20	1 10	17 29	17 26	17 24	17 21
66	5 23	1 52	17 10	17 14	17 16	17 18
64	5 26	2 20	16 55	17 03	17 10	17 15
62	5 28	2 39	16 42	16 55	17 04	17 13
60	5 30	2 56	16 32	16 47	16 59	17 11
58	5 32	3 09	16 22	16 40	16 55	17 09
56	5 33	3 19	16 14	16 34	16 51	17 07
54	5 35	3 29	16 07	16 29	16 48	17 06
52	5 36	3 36	16 00	16 24	16 45	17 04
50	5 37	3 44	15 54	16 19	16 42	17 03
45	5 40	3 58	15 41	16 10	16 36	17 00
40	5 42	4 09	15 30	16 01	16 30	16 58
35	5 43	4 18	15 21	15 55	16 26	16 56
30	5 45	4 24	15 13	15 48	16 22	16 54
20	5 48	4 33	14 59	15 38	16 15	16 51
10	5 50	4 40	14 47	15 28	16 09	16 48
0	5 52	4 43	14 35	15 20	16 03	16 46
10	5 53	4 44	14 24	15 11	15 57	16 43
20	5 55	4 43	14 12	15 01	15 51	16 41
30	5 57	4 38	13 58	14 51	15 44	16 38
35	5 58	4 36	13 49	14 44	15 40	16 36
40	5 59	4 31	13 40	14 37	15 35	16 34
45	6 01	4 24	13 29	14 29	15 30	16 32
50	6 02	4 16	13 16	14 19	15 24	16 29
52	6 03	4 11	13 09	14 14	15 20	16 28
54	6 04	4 07	13 02	14 09	15 17	16 26
56	6 04	4 01	12 55	14 04	15 14	16 25
58	6 05	3 55	12 46	13 57	15 10	16 23
60	6 06	3 47	12 36	13 50	15 05	16 21

Lat. N	Sunset	Twlt. ends	Moonset 15	16	17	18
°	h m	h m	h m	h m	h m	h m
72	18 35	////	23 23	25 18	1 18	3 06
70	18 31	////	23 54	25 36	1 36	3 15
68	18 28	22 28	24 17	0 17	1 50	3 22
66	18 25	21 49	24 34	0 34	2 01	3 28
64	18 22	21 23	24 49	0 49	2 11	3 33
62	18 20	21 04	25 01	1 01	2 19	3 37
60	18 18	20 49	25 11	1 11	2 26	3 41
58	18 17	20 37	0 09	1 20	2 32	3 45
56	18 15	20 26	0 19	1 27	2 37	3 47
54	18 14	20 18	0 28	1 34	2 42	3 50
52	18 13	20 10	0 36	1 40	2 46	3 53
50	18 11	20 03	0 43	1 46	2 50	3 55
45	18 09	19 49	0 58	1 58	2 58	4 00
40	18 07	19 39	1 10	2 07	3 05	4 04
35	18 06	19 31	1 21	2 16	3 11	4 07
30	18 04	19 24	1 30	2 23	3 16	4 10
20	18 02	19 15	1 46	2 36	3 25	4 15
10	18 00	19 10	1 59	2 47	3 33	4 20
0	17 58	19 07	2 12	2 57	3 41	4 24
10	17 56	19 06	2 25	3 07	3 48	4 28
20	17 55	19 08	2 38	3 18	3 56	4 32
30	17 53	19 13	2 54	3 30	4 04	4 37
35	17 52	19 16	3 02	3 37	4 09	4 40
40	17 51	19 21	3 13	3 45	4 15	4 43
45	17 50	19 28	3 24	3 54	4 22	4 47
50	17 49	19 38	3 39	4 06	4 29	4 51
52	17 48	19 42	3 45	4 11	4 33	4 53
54	17 47	19 47	3 53	4 17	4 37	4 55
56	17 46	19 52	4 01	4 23	4 41	4 58
58	17 46	20 00	4 10	4 30	4 46	5 01
60	17 45	20 08	4 21	4 38	4 52	5 04

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
15	20 46	9 00	23 41	11 27	16 06
16	21 30	9 00	23 36	11 23	16 02
17	22 13	9 01	23 31	11 20	15 59
18	22 56	9 01	23 26	11 17	15 55

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.2	0.2	0.4
30	0.2	0.1	0.3
45	0.2	0.1	0.2
60	0.2	0.1	0.1
75	0.2	0.0	0.1
90			

Moon's Lower Limb **Add**

Alt.	15	16	17
°	′	′	′
0	11.9	12.1	12.4
4	11.9	12.1	12.4
8	11.9	12.2	12.4
12	11.9	12.2	12.4
16	12.0	12.2	12.5
20	12.1	12.3	12.6
24	12.2	12.4	12.6
28	12.2	12.5	12.7
32	12.4	12.6	12.8
36	12.5	12.7	12.9
40	12.6	12.8	13.0
44	12.7	12.9	13.1
48	12.9	13.1	13.3
52	13.1	13.2	13.4
56	13.2	13.4	13.5
60	13.4	13.5	13.7
64	13.6	13.7	13.9
68	13.8	13.9	14.0
72	14.0	14.1	14.2
76	14.2	14.3	14.4
80	14.4	14.4	14.5
84	14.6	14.6	14.7
88	14.7	14.8	14.8
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	15	16	17
°	′	′	′
0	17.7	17.5	17.4
4	17.6	17.5	17.4
8	17.6	17.5	17.3
12	17.6	17.4	17.3
16	17.5	17.4	17.2
20	17.5	17.3	17.2
24	17.4	17.2	17.1
28	17.3	17.2	17.0
32	17.2	17.1	16.9
36	17.0	16.9	16.8
40	16.9	16.8	16.7
44	16.8	16.7	16.6
48	16.6	16.6	16.5
52	16.5	16.4	16.3
56	16.3	16.2	16.2
60	16.1	16.1	16.0
64	15.9	15.9	15.9
68	15.8	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.2
84	15.0	15.0	15.0
88	14.8	14.9	14.9
90			

Subtract from table, back cover

Day of Atonement (Yom Kippur) 15

GMT	♈ GHA	VENUS −3.8 GHA	VENUS −3.8 Dec.	MARS −2.5 GHA	MARS −2.5 Dec.	JUPITER −1.2 GHA	JUPITER −1.2 Dec.	SATURN 0.8 GHA	SATURN 0.8 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
18 0	356 53.2	224 48.1	+16 30.0	7 20.5	−10 31.8	190 20.7	+ 6 49.9	120 39.5	−17 56.6	25 53.5	149	− 6 29.9	+106
1	11 55.7	239 47.8	29.5	22 23.6	31.9	205 22.6	49.7	135 41.8	56.7	40 27.4	149	6 19.3	+107
2	26 58.1	254 47.5	29.0	37 26.7	32.0	220 24.6	49.5	150 44.0	56.7	55 01.3	149	6 08.6	+106
3	42 00.6	269 47.2	·· 28.5	52 29.8	·· 32.1	235 26.6	·· 49.3	165 46.3	·· 56.8	69 35.2	150	· 5 58.0	+108
4	57 03.1	284 47.0	28.0	67 32.9	32.2	250 28.5	49.1	180 48.6	56.8	84 09.2	149	5 47.2	+107
5	72 05.5	299 46.7	27.5	82 36.0	32.3	265 30.5	48.9	195 50.9	56.9	98 43.1	149	5 36.5	+108
6	87 08.0	314 46.4	+16 27.0	97 39.1	−10 32.4	280 32.4	+ 6 48.7	210 53.1	−17 56.9	113 17.0	150	− 5 25.7	+108
7	102 10.5	329 46.2	26.4	112 42.2	32.5	295 34.4	48.5	225 55.4	57.0	127 51.0	149	5 14.9	+108
8	117 12.9	344 45.9	25.9	127 45.3	32.6	310 36.4	48.3	240 57.7	57.0	142 24.9	149	5 04.1	+109
9	132 15.4	359 45.6	·· 25.4	142 48.4	·· 32.7	325 38.3	·· 48.1	256 00.0	·· 57.1	156 58.8	149	· 4 53.2	+109
10	147 17.8	14 45.3	24.9	157 51.5	32.8	340 40.3	47.9	271 02.3	57.1	171 32.7	150	4 42.3	+109
11	162 20.3	29 45.1	24.4	172 54.6	32.9	355 42.3	47.7	286 04.5	57.2	186 06.7	149	4 31.4	+109
12	177 22.8	44 44.8	+16 23.9	187 57.7	−10 33.0	10 44.2	+ 6 47.4	301 06.8	−17 57.2	200 40.6	149	− 4 20.5	+110
13	192 25.2	59 44.5	23.4	203 00.8	33.1	25 46.2	47.2	316 09.1	57.3	215 14.5	149	4 09.5	+110
14	207 27.7	74 44.2	22.9	218 03.9	33.2	40 48.2	47.0	331 11.4	57.3	229 48.4	149	3 58.5	+110
15	222 30.2	89 44.0	·· 22.3	233 07.0	·· 33.3	55 50.1	·· 46.8	346 13.6	·· 57.4	244 22.3	149	· 3 47.5	+110
16	237 32.6	104 43.7	21.8	248 10.1	33.4	70 52.1	46.6	1 15.9	57.4	258 56.2	149	3 36.5	+111
17	252 35.1	119 43.4	21.3	263 13.2	33.5	85 54.1	46.4	16 18.2	57.5	273 30.1	149	3 25.4	+110
18	267 37.6	134 43.1	+16 20.8	278 16.3	−10 33.6	100 56.0	+ 6 46.2	31 20.5	−17 57.5	288 04.0	149	− 3 14.4	+111
19	282 40.0	149 42.9	20.3	293 19.4	33.7	115 58.0	46.0	46 22.7	57.6	302 37.9	149	3 03.3	+111
20	297 42.5	164 42.6	19.7	308 22.5	33.8	130 59.9	45.8	61 25.0	57.6	317 11.8	148	2 52.2	+112
21	312 45.0	179 42.3	·· 19.2	323 25.6	·· 33.9	146 01.9	·· 45.6	76 27.3	·· 57.7	331 45.6	149	· 2 41.0	+111
22	327 47.4	194 42.0	18.7	338 28.7	34.0	161 03.9	45.4	91 29.6	57.7	346 19.5	148	2 29.9	+112
23	342 49.9	209 41.7	18.2	353 31.8	34.0	176 05.8	45.2	106 31.8	57.8	0 53.3	149	2 18.7	+112
19 0	357 52.3	224 41.5	+16 17.7	8 34.9	−10 34.1	191 07.8	+ 6 45.0	121 34.1	−17 57.8	15 27.2	148	− 2 07.5	+112
1	12 54.8	239 41.2	17.1	23 38.0	34.2	206 09.8	44.8	136 36.4	57.9	30 01.0	148	1 56.3	+112
2	27 57.3	254 40.9	16.6	38 41.1	34.3	221 11.7	44.6	151 38.7	57.9	44 34.8	148	1 45.1	+112
3	42 59.7	269 40.6	·· 16.1	53 44.2	·· 34.4	236 13.7	·· 44.4	166 40.9	·· 58.0	59 08.6	148	· 1 33.9	+112
4	58 02.2	284 40.4	15.6	68 47.3	34.5	251 15.7	44.2	181 43.2	58.0	73 42.4	147	1 22.7	+113
5	73 04.7	299 40.1	15.0	83 50.4	34.6	266 17.6	44.0	196 45.5	58.1	88 16.1	148	1 11.4	+113
6	88 07.1	314 39.8	+16 14.5	98 53.4	−10 34.7	281 19.6	+ 6 43.8	211 47.8	−17 58.1	102 49.9	147	− 1 00.1	+112
7	103 09.6	329 39.5	14.0	113 56.5	34.8	296 21.6	43.5	226 50.0	58.2	117 23.6	148	0 48.9	+113
8	118 12.1	344 39.2	13.4	128 59.6	34.9	311 23.5	43.3	241 52.3	58.2	131 57.4	147	0 37.6	+113
9	133 14.5	359 39.0	·· 12.9	144 02.7	·· 34.9	326 25.5	·· 43.1	256 54.6	·· 58.3	146 31.1	147	· 0 26.3	+113
10	148 17.0	14 38.7	12.4	159 05.8	35.0	341 27.4	42.9	271 56.9	58.3	161 04.8	146	0 15.0	+113
11	163 19.5	29 38.4	11.8	174 08.9	35.1	356 29.4	42.7	286 59.1	58.4	175 38.4	147	− 0 03.7	+113
12	178 21.9	44 38.1	+16 11.3	189 12.0	−10 35.2	11 31.4	+ 6 42.5	302 01.4	−17 58.4	190 12.1	146	+ 0 07.6	+114
13	193 24.4	59 37.8	10.8	204 15.1	35.3	26 33.3	42.3	317 03.7	58.5	204 45.7	146	0 19.0	+113
14	208 26.8	74 37.6	10.2	219 18.1	35.4	41 35.3	42.1	332 06.0	58.5	219 19.3	146	0 30.3	+113
15	223 29.3	89 37.3	·· 09.7	234 21.2	·· 35.5	56 37.3	·· 41.9	347 08.2	·· 58.6	233 52.9	146	· 0 41.6	+114
16	238 31.8	104 37.0	09.2	249 24.3	35.5	71 39.2	41.7	2 10.5	58.6	248 26.5	145	0 53.0	+113
17	253 34.2	119 36.7	08.6	264 27.4	35.6	86 41.2	41.5	17 12.8	58.7	263 00.0	145	1 04.3	+114
18	268 36.7	134 36.4	+16 08.1	279 30.5	−10 35.7	101 43.2	+ 6 41.3	32 15.0	−17 58.7	277 33.5	145	+ 1 15.7	+113
19	283 39.2	149 36.2	07.6	294 33.6	35.8	116 45.1	41.1	47 17.3	58.8	292 07.0	145	1 27.0	+114
20	298 41.6	164 35.9	07.0	309 36.6	35.9	131 47.1	40.9	62 19.6	58.8	306 40.5	145	1 38.4	+113
21	313 44.1	179 35.6	·· 06.5	324 39.7	·· 36.0	146 49.1	·· 40.7	77 21.9	·· 58.9	321 14.0	144	· 1 49.7	+114
22	328 46.6	194 35.3	05.9	339 42.8	36.0	161 51.0	40.5	92 24.1	58.9	335 47.4	144	2 01.1	+113
23	343 49.0	209 35.0	05.4	354 45.9	36.1	176 53.0	40.3	107 26.4	59.0	350 20.8	143	2 12.4	+114
20 0	358 51.5	224 34.8	+16 04.8	9 49.0	−10 36.2	191 55.0	+ 6 40.1	122 28.7	−17 59.0	4 54.1	144	+ 2 23.8	+113
1	13 53.9	239 34.5	04.3	24 52.0	36.3	206 56.9	39.9	137 30.9	59.1	19 27.5	143	2 35.1	+113
2	28 56.4	254 34.2	03.8	39 55.1	36.4	221 58.9	39.7	152 33.2	59.1	34 00.8	143	2 46.4	+114
3	43 58.9	269 33.9	·· 03.2	54 58.2	·· 36.4	237 00.9	·· 39.4	167 35.5	·· 59.2	48 34.1	142	· 2 57.8	+113
4	59 01.3	284 33.6	02.7	70 01.3	36.5	252 02.8	39.2	182 37.8	59.2	63 07.3	143	3 09.1	+113
5	74 03.8	299 33.3	02.1	85 04.3	36.6	267 04.8	39.0	197 40.0	59.3	77 40.6	142	3 20.4	+113
6	89 06.3	314 33.1	+16 01.6	100 07.4	−10 36.7	282 06.8	+ 6 38.8	212 42.3	−17 59.3	92 13.8	141	+ 3 31.7	+114
7	104 08.7	329 32.8	01.0	115 10.5	36.7	297 08.7	38.6	227 44.6	59.4	106 46.9	141	3 43.1	+113
8	119 11.2	344 32.5	16 00.5	130 13.6	36.8	312 10.7	38.4	242 46.8	59.4	121 20.0	141	3 54.4	+112
9	134 13.7	359 32.2	·15 59.9	145 16.6	·· 36.9	327 12.7	·· 38.2	257 49.1	·· 59.5	135 53.1	141	· 4 05.6	+113
10	149 16.1	14 31.9	59.4	160 19.7	37.0	342 14.6	38.0	272 51.4	59.5	150 26.2	140	4 16.9	+113
11	164 18.6	29 31.6	58.8	175 22.8	37.0	357 16.6	37.8	287 53.7	59.6	164 59.2	140	4 28.2	+112
12	179 21.1	44 31.4	+15 58.3	190 25.9	−10 37.1	12 18.6	+ 6 37.6	302 55.9	−17 59.6	179 32.2	140	+ 4 39.4	+113
13	194 23.5	59 31.1	57.7	205 28.9	37.2	27 20.5	37.4	317 58.2	59.7	194 05.2	139	4 50.7	+112
14	209 26.0	74 30.8	57.2	220 32.0	37.3	42 22.5	37.2	333 00.5	59.7	208 38.1	139	5 01.9	+112
15	224 28.4	89 30.5	·· 56.6	235 35.1	·· 37.3	57 24.4	·· 37.0	348 02.7	·· 59.8	223 11.0	138	· 5 13.1	+112
16	239 30.9	104 30.2	56.0	250 38.1	37.4	72 26.4	36.8	3 05.0	59.8	237 43.8	138	5 24.3	+112
17	254 33.4	119 29.9	55.5	265 41.2	37.5	87 28.4	36.6	18 07.3	59.9	252 16.6	138	5 35.5	+112
18	269 35.8	134 29.6	+15 54.9	280 44.3	−10 37.6	102 30.3	+ 6 36.4	33 09.5	−17 59.9	266 49.4	137	+ 5 46.7	+111
19	284 38.3	149 29.4	54.4	295 47.3	37.6	117 32.3	36.2	48 11.8	18 00.0	281 22.1	137	5 57.8	+111
20	299 40.8	164 29.1	53.8	310 50.4	37.7	132 34.3	36.0	63 14.1	00.0	295 54.8	136	6 08.9	+111
21	314 43.2	179 28.8	·· 53.2	325 53.5	·· 37.8	147 36.2	·· 35.8	78 16.4	·· 00.1	310 27.4	136	· 6 20.0	+111
22	329 45.7	194 28.5	52.7	340 56.5	37.8	162 38.2	35.6	93 18.6	00.1	325 00.0	136	6 31.1	+111
23	344 48.2	209 28.2	52.1	355 59.6	37.9	177 40.2	35.3	108 20.9	00.2	339 32.6	135	6 42.2	+110
24	359 50.6	224 27.9	+15 51.6	11 02.7	−10 38.0	192 42.1	+ 6 35.1	123 23.2	−18 00.2	354 05.1	135	+ 6 53.2	+110
code	—	− 3	− 5	+ 31	− 1	+ 19	− 2	+ 23	− 1				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
18 0	181 26.0	+ 1 58.1	7	Acamar	315 50.3	−40 28.3
1	196 26.2	57.1	5	Achernar	335 57.8	−57 27.1
2	211 26.5	56.2	30	Acrux	173 57.6	−62 51.7
3	226 26.7	·· 55.2	19	Adhara	255 46.1	−28 54.5
4	241 26.9	54.2	10	Aldebaran	291 38.1	+16 25.5
5	256 27.1	53.3				
6	271 27.4	+ 1 52.3	32	Alioth	166 58.5	+56 11.7
7	286 27.6	51.3	34	Alkaid	153 32.8	+49 31.9
8	301 27.8	50.3	55	Al Na'ir	28 36.6	−47 10.2
9	316 28.0	·· 49.4	15	Alnilam	276 29.5	− 1 13.6
10	331 28.2	48.4	25	Alphard	218 38.1	− 8 28.2
11	346 28.5	47.4				
12	1 28.7	+ 1 46.5	41	Alphecca	126 47.2	+26 51.8
13	16 28.9	45.5	1	Alpheratz	358 27.2	+28 51.3
14	31 29.1	44.5	51	Altair	62 49.6	+ 8 45.4
15	46 29.4	·· 43.6	2	Ankaa	353 57.2	−42 32.2
16	61 29.6	42.6	42	Antares	113 18.6	−26 20.3
17	76 29.8	41.6				
18	91 30.0	+ 1 40.7	37	Arcturus	146 34.8	+19 24.6
19	106 30.2	39.7	43	Atria	108 58.7	−68 57.3
20	121 30.5	38.7	22	Avior	234 35.8	−59 22.0
21	136 30.7	·· 37.8	13	Bellatrix	279 17.6	+ 6 18.8
22	151 30.9	36.8	16	Betelg'se	271 47.4	+ 7 24.1
23	166 31.1	35.8				
			17	Canopus	264 15.1	−52 40.0
19 0	181 31.4	+ 1 34.8	12	Capella	281 37.3	+45 57.2
1	196 31.6	33.9	53	Deneb	50 00.2	+45 07.9
2	211 31.8	32.9	28	Denebola	183 17.3	+14 48.9
3	226 32.0	·· 31.9	4	Diphda	349 38.2	−18 13.2
4	241 32.2	31.0				
5	256 32.5	30.0	27	Dubhe	194 44.4	+61 59.0
6	271 32.7	+ 1 29.0	14	Elnath	279 06.4	+28 34.3
7	286 32.9	28.1	47	Eltanin	91 05.9	+51 30.0
8	301 33.1	27.1	54	Enif	34 28.6	+ 9 40.8
9	316 33.4	·· 26.1	56	Fomalhaut	16 10.5	−29 50.9
10	331 33.6	25.1				
11	346 33.8	24.2	31	Gacrux	172 48.9	−56 52.3
12	1 34.0	+ 1 23.2	29	Gienah	176 36.4	−17 18.1
13	16 34.2	22.2	35	Hadar	149 48.9	−60 10.1
14	31 34.5	21.3	6	Hamal	328 48.5	+23 15.6
15	46 34.7	·· 20.3	48	Kaus Aust.	84 40.1	−34 24.4
16	61 34.9	19.3				
17	76 35.1	18.4	40	Kochab	137 18.9	+74 20.2
18	91 35.4	+ 1 17.4	57	Markab	14 20.4	+14 58.6
19	106 35.6	16.4	8	Menkar	314 59.3	+ 3 55.4
20	121 35.8	15.4	36	Menkent	148 58.1	−36 09.5
21	136 36.0	·· 14.5	24	Miapl'dus	221 49.5	−69 32.2
22	151 36.2	13.5				
23	166 36.5	12.5	9	Mirfak	309 41.0	+49 42.4
			50	Nunki	76 50.9	−26 21.1
20 0	181 36.7	+ 1 11.6	52	Peacock	54 25.8	−56 52.6
1	196 36.9	10.6	21	Pollux	244 19.9	+28 07.8
2	211 37.1	09.6	20	Procyon	245 44.4	+ 5 20.2
3	226 37.4	·· 08.7				
4	241 37.6	07.7	46	R'alhague	96 46.0	+12 35.7
5	256 37.8	06.7	26	Regulus	208 29.0	+12 10.8
6	271 38.0	+ 1 05.7	11	Rigel	281 52.9	− 8 14.9
7	286 38.2	04.8	38	Rigil Kent.	140 50.4	−60 39.7
8	301 38.5	03.8	44	Sabik	103 01.4	−15 40.3
9	316 38.7	·· 02.8				
10	331 38.9	01.9	3	Schedar	350 28.5	+56 18.1
11	346 39.1	1 00.9	45	Shaula	97 19.7	−37 04.5
12	1 39.4	+ 0 59.9	18	Sirius	259 11.3	−16 39.2
13	16 39.6	58.9	33	Spica	159 16.4	−10 56.1
14	31 39.8	58.0	23	Suhail	223 24.1	−43 15.3
15	46 40.0	·· 57.0				
16	61 40.2	56.0	49	Vega	81 07.7	+38 44.9
17	76 40.5	55.1	39	Zub'g'bi	137 52.8	−15 51.8
18	91 40.7	+ 0 54.1				
19	106 40.9	53.1				
20	121 41.1	52.1				
21	136 41.3	·· 51.2				
22	151 41.6	50.2				
23	166 41.8	49.2				
24	181 42.0	+ 0 48.3				
code	—	− 10				

GMT	Equation of Time (App.—Mean) 18	19	20
h	m s	m s	m s
0	+ 5 43.6	+ 6 05.0	+ 6 26.3
6	+ 5 49.0	+ 6 10.3	+ 6 31.6
12	+ 5 54.3	+ 6 15.7	+ 6 37.0
18	+ 5 59.6	+ 6 21.0	+ 6 42.3
24	+ 6 05.0	+ 6 26.3	+ 6 47.6

Lat. N	Sunrise	Twlt. begins	Moonrise 18	19	20	21
°	h m	h m	h m	h m	h m	h m
72	5 25	////	17 29	17 16	17 02	16 47
70	5 28	0 39	17 25	17 17	17 10	17 02
68	5 30	1 39	17 21	17 18	17 16	17 14
66	5 32	2 11	17 18	17 19	17 21	17 24
64	5 34	2 33	17 15	17 20	17 26	17 32
62	5 36	2 51	17 13	17 21	17 30	17 40
60	5 37	3 06	17 11	17 22	17 33	17 46
58	5 38	3 17	17 09	17 22	17 36	17 52
56	5 39	3 27	17 07	17 23	17 39	17 57
54	5 40	3 35	17 06	17 23	17 41	18 01
52	5 41	3 43	17 04	17 24	17 43	18 05
50	5 42	3 49	17 03	17 24	17 46	18 09
45	5 43	4 02	17 00	17 25	17 50	18 17
40	5 45	4 13	16 58	17 25	17 54	18 24
35	5 46	4 20	16 56	17 26	17 57	18 30
30	5 47	4 26	16 54	17 27	18 00	18 35
20	5 48	4 35	16 51	17 28	18 05	18 44
10	5 49	4 39	16 48	17 29	18 09	18 52
0	5 51	4 42	16 46	17 29	18 14	19 00
10	5 51	4 42	16 43	17 30	18 18	19 07
20	5 52	4 40	16 41	17 31	18 22	19 15
30	5 53	4 35	16 38	17 32	18 28	19 25
35	5 54	4 31	16 36	17 33	18 31	19 30
40	5 54	4 25	16 34	17 33	18 34	19 36
45	5 55	4 19	16 32	17 34	18 38	19 44
50	5 55	4 09	16 29	17 35	18 43	19 52
52	5 56	4 04	16 28	17 36	18 45	19 56
54	5 56	3 59	16 26	17 36	18 48	20 01
56	5 56	3 52	16 25	17 37	18 50	20 06
58	5 57	3 45	16 23	17 38	18 54	20 11
60	5 57	3 36	16 21	17 38	18 57	20 18

Lat. N	Sunset	Twlt. ends	Moonset 18	19	20	21
°	h m	h m	h m	h m	h m	h m
72	18 20	////	3 06	4 50	6 36	8 26
70	18 17	22 49	3 15	4 52	6 31	8 13
68	18 15	21 59	3 22	4 54	6 27	8 02
66	18 13	21 29	3 28	4 55	6 23	7 54
64	18 12	21 08	3 33	4 56	6 20	7 47
62	18 10	20 51	3 37	4 57	6 18	7 40
60	18 09	20 37	3 41	4 58	6 16	7 35
58	18 08	20 26	3 45	4 58	6 14	7 30
56	18 07	20 17	3 47	4 59	6 12	7 26
54	18 06	20 08	3 50	5 00	6 10	7 22
52	18 06	20 02	3 53	5 00	6 09	7 19
50	18 05	19 55	3 55	5 01	6 08	7 16
45	18 03	19 42	4 00	5 02	6 05	7 09
40	18 02	19 33	4 04	5 02	6 03	7 04
35	18 01	19 26	4 07	5 03	6 00	6 59
30	18 00	19 20	4 10	5 04	5 59	6 55
20	17 59	19 12	4 15	5 05	5 56	6 48
10	17 58	19 08	4 20	5 06	5 53	6 41
0	17 57	19 06	4 24	5 07	5 50	6 35
10	17 56	19 06	4 28	5 08	5 48	6 29
20	17 56	19 09	4 32	5 08	5 45	6 23
30	17 55	19 15	4 37	5 09	5 42	6 16
35	17 54	19 18	4 40	5 10	5 40	6 12
40	17 54	19 25	4 43	5 11	5 38	6 07
45	17 54	19 33	4 47	5 11	5 36	6 02
50	17 53	19 42	4 51	5 12	5 33	5 55
52	17 53	19 47	4 53	5 13	5 32	5 52
54	17 53	19 53	4 55	5 13	5 30	5 49
56	17 53	20 00	4 58	5 13	5 29	5 46
58	17 52	20 07	5 01	5 14	5 27	5 42
60	17 52	20 16	5 04	5 14	5 25	5 37

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
18	22 56	9 01	23 26	11 17	15 55
19	23 40	9 01	23 21	11 14	15 51
20	24 24	9 02	23 16	11 11	15 48
21	0 24	9 02	23 11	11 08	15 44

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.3	0.2	0.4
30	0.3	0.1	0.3
45	0.3	0.1	0.2
60	0.3	0.1	0.1
75	0.3	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	18	19	20
°	′	′	′
0	12.8	13.3	13.8
4	12.8	13.3	13.8
8	12.8	13.3	13.8
12	12.8	13.3	13.8
16	12.9	13.3	13.8
20	12.9	13.4	13.9
24	13.0	13.4	13.9
28	13.0	13.5	14.0
32	13.1	13.6	14.0
36	13.2	13.6	14.1
40	13.3	13.7	14.1
44	13.4	13.8	14.2
48	13.5	13.9	14.3
52	13.7	14.0	14.3
56	13.8	14.1	14.4
60	13.9	14.2	14.5
64	14.1	14.3	14.6
68	14.2	14.4	14.7
72	14.3	14.6	14.8
76	14.5	14.7	14.9
80	14.6	14.8	15.0
84	14.8	14.9	15.1
88	14.9	15.0	15.1
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	18	19	20
°	′	′	′
0	17.2	16.9	16.6
4	17.1	16.8	16.6
8	17.1	16.8	16.5
12	17.1	16.8	16.5
16	17.0	16.8	16.5
20	17.0	16.7	16.5
24	16.9	16.7	16.4
28	16.9	16.6	16.4
32	16.8	16.6	16.3
36	16.7	16.5	16.3
40	16.6	16.4	16.2
44	16.5	16.3	16.1
48	16.4	16.2	16.1
52	16.2	16.1	16.0
56	16.1	16.0	15.9
60	16.0	15.9	15.8
64	15.8	15.8	15.7
68	15.7	15.7	15.6
72	15.6	15.6	15.6
76	15.4	15.4	15.5
80	15.3	15.3	15.4
84	15.1	15.2	15.3
88	15.0	15.1	15.2
90			

Subtract from table, back cover

First Day of Feast of Tabernacles (Succoth) 20
Full Moon 20

GMT	♈ GHA	VENUS −3.8 GHA	VENUS −3.8 Dec.	MARS −2.5 GHA	MARS −2.5 Dec.	JUPITER −1.2 GHA	JUPITER −1.2 Dec.	SATURN 0.8 GHA	SATURN 0.8 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
21 0	359 50.6	224 27.9	+15 51.6	11 02.7	−10 38.0	192 42.1	+ 6 35.1	123 23.2	−18 00.2	354 05.1	135	+ 6 53.2	+110
1	14 53.1	239 27.6	51.0	26 05.7	38.0	207 44.1	34.9	138 25.4	00.3	8 37.6	134	7 04.2	+110
2	29 55.6	254 27.4	50.4	41 08.8	38.1	222 46.1	34.7	153 27.7	00.3	23 10.0	134	7 15.2	+110
3	44 58.0	269 27.1	·· 49.9	56 11.8	·· 38.2	237 48.0	·· 34.5	168 30.0	·· 00.4	37 42.4	133	· 7 26.2	+109
4	60 00.5	284 26.8	49.3	71 14.9	38.2	252 50.0	34.3	183 32.2	00.4	52 14.7	133	7 37.1	+109
5	75 02.9	299 26.5	48.7	86 18.0	38.3	267 52.0	34.1	198 34.5	00.5	66 47.0	132	7 48.0	+109
6	90 05.4	314 26.2	+15 48.2	101 21.0	−10 38.4	282 53.9	+ 6 33.9	213 36.8	−18 00.5	81 19.2	132	+ 7 58.9	+109
7	105 07.9	329 25.9	47.6	116 24.1	38.4	297 55.9	33.7	228 39.0	00.6	95 51.4	132	8 09.8	+108
8	120 10.3	344 25.6	47.0	131 27.1	38.5	312 57.9	33.5	243 41.3	00.6	110 23.6	131	8 20.6	+108
9	135 12.8	359 25.3	·· 46.5	146 30.2	·· 38.6	327 59.8	·· 33.3	258 43.6	·· 00.7	124 55.7	130	· 8 31.4	+107
10	150 15.3	14 25.1	45.9	161 33.2	38.6	343 01.8	33.1	273 45.8	00.7	139 27.7	130	8 42.1	+107
11	165 17.7	29 24.8	45.3	176 36.3	38.7	358 03.8	32.9	288 48.1	00.8	153 59.7	130	8 52.8	+107
12	180 20.2	44 24.5	+15 44.7	191 39.3	−10 38.8	13 05.7	+ 6 32.7	303 50.4	−18 00.8	168 31.7	129	+ 9 03.5	+107
13	195 22.7	59 24.2	44.2	206 42.4	38.8	28 07.7	32.5	318 52.7	00.9	183 03.6	128	9 14.2	+106
14	210 25.1	74 23.9	43.6	221 45.5	38.9	43 09.7	32.3	333 54.9	00.9	197 35.4	128	9 24.8	+106
15	225 27.6	89 23.6	·· 43.0	236 48.5	·· 38.9	58 11.6	·· 32.1	348 57.2	·· 01.0	212 07.2	128	· 9 35.4	+105
16	240 30.0	104 23.3	42.4	251 51.6	39.0	73 13.6	31.9	3 59.5	01.0	226 39.0	127	9 45.9	+105
17	255 32.5	119 23.0	41.9	266 54.6	39.1	88 15.6	31.7	19 01.7	01.1	241 10.7	126	9 56.4	+105
18	270 35.0	134 22.7	+15 41.3	281 57.7	−10 39.1	103 17.5	+ 6 31.5	34 04.0	−18 01.1	255 42.3	126	+10 06.9	+104
19	285 37.4	149 22.5	40.7	297 00.7	39.2	118 19.5	31.3	49 06.3	01.2	270 13.9	125	10 17.3	+104
20	300 39.9	164 22.2	40.1	312 03.8	39.2	133 21.5	31.0	64 08.5	01.2	284 45.4	125	10 27.7	+103
21	315 42.4	179 21.9	·· 39.6	327 06.8	·· 39.3	148 23.4	·· 30.8	79 10.8	·· 01.3	299 16.9	124	·10 38.0	+103
22	330 44.8	194 21.6	39.0	342 09.8	39.3	163 25.4	30.6	94 13.0	01.3	313 48.3	123	10 48.3	+103
23	345 47.3	209 21.3	38.4	357 12.9	39.4	178 27.4	30.4	109 15.3	01.4	328 19.6	123	10 58.6	+102
22 0	0 49.8	224 21.0	+15 37.8	12 15.9	−10 39.5	193 29.3	+ 6 30.2	124 17.6	−18 01.4	342 50.9	123	+11 08.8	+101
1	15 52.2	239 20.7	37.2	27 19.0	39.5	208 31.3	30.0	139 19.8	01.5	357 22.2	122	11 18.9	+101
2	30 54.7	254 20.4	36.6	42 22.0	39.6	223 33.3	29.8	154 22.1	01.5	11 53.4	121	11 29.0	+101
3	45 57.2	269 20.1	·· 36.1	57 25.1	·· 39.6	238 35.2	·· 29.6	169 24.4	·· 01.6	26 24.5	121	·11 39.1	+100
4	60 59.6	284 19.8	35.5	72 28.1	39.7	253 37.2	29.4	184 26.6	01.6	40 55.6	120	11 49.1	+ 99
5	76 02.1	299 19.5	34.9	87 31.2	39.7	268 39.2	29.2	199 28.9	01.7	55 26.6	119	11 59.0	+ 99
6	91 04.5	314 19.3	+15 34.3	102 34.2	−10 39.8	283 41.1	+ 6 29.0	214 31.2	−18 01.7	69 57.5	119	+12 08.9	+ 99
7	106 07.0	329 19.0	33.7	117 37.2	39.8	298 43.1	28.8	229 33.4	01.8	84 28.4	118	12 18.8	+ 98
8	121 09.5	344 18.7	33.1	132 40.3	39.9	313 45.1	28.6	244 35.7	01.8	98 59.2	118	12 28.6	+ 97
9	136 11.9	359 18.4	·· 32.5	147 43.3	·· 39.9	328 47.0	·· 28.4	259 38.0	·· 01.9	113 30.0	117	·12 38.3	+ 97
10	151 14.4	14 18.1	31.9	162 46.4	40.0	343 49.0	28.2	274 40.2	01.9	128 00.7	117	12 48.0	+ 96
11	166 16.9	29 17.8	31.3	177 49.4	40.0	358 51.0	28.0	289 42.5	02.0	142 31.4	115	12 57.6	+ 96
12	181 19.3	44 17.5	+15 30.8	192 52.4	−10 40.1	13 53.0	+ 6 27.8	304 44.8	−18 02.0	157 01.9	116	+13 07.2	+ 95
13	196 21.8	59 17.2	30.2	207 55.5	40.1	28 54.9	27.6	319 47.0	02.1	171 32.5	114	13 16.7	+ 94
14	211 24.3	74 16.9	29.6	222 58.5	40.2	43 56.9	27.4	334 49.3	02.1	186 02.9	114	13 26.1	+ 94
15	226 26.7	89 16.6	·· 29.0	238 01.5	·· 40.2	58 58.9	·· 27.2	349 51.5	·· 02.2	200 33.3	113	·13 35.5	+ 93
16	241 29.2	104 16.3	28.4	253 04.6	40.3	74 00.8	27.0	4 53.8	02.2	215 03.6	113	13 44.8	+ 93
17	256 31.6	119 16.0	27.8	268 07.6	40.3	89 02.8	26.8	19 56.1	02.3	229 33.9	112	13 54.1	+ 92
18	271 34.1	134 15.7	+15 27.2	283 10.6	−10 40.4	104 04.8	+ 6 26.5	34 58.3	−18 02.3	244 04.1	112	+14 03.3	+ 91
19	286 36.6	149 15.5	26.6	298 13.7	40.4	119 06.7	26.3	50 00.6	02.4	258 34.3	110	14 12.4	+ 91
20	301 39.0	164 15.2	26.0	313 16.7	40.5	134 08.7	26.1	65 02.9	02.4	273 04.3	110	14 21.5	+ 89
21	316 41.5	179 14.9	·· 25.4	328 19.7	·· 40.5	149 10.7	·· 25.9	80 05.1	·· 02.5	287 34.3	110	·14 30.4	+ 90
22	331 44.0	194 14.6	24.8	343 22.7	40.6	164 12.6	25.7	95 07.4	02.5	302 04.3	109	14 39.4	+ 88
23	346 46.4	209 14.3	24.2	358 25.8	40.6	179 14.6	25.5	110 09.7	02.6	316 34.2	108	14 48.2	+ 88
23 0	1 48.9	224 14.0	+15 23.6	13 28.8	−10 40.6	194 16.6	+ 6 25.3	125 11.9	−18 02.6	331 04.0	107	+14 57.0	+ 87
1	16 51.4	239 13.7	23.0	28 31.8	40.7	209 18.5	25.1	140 14.2	02.7	345 33.7	107	15 05.7	+ 87
2	31 53.8	254 13.4	22.4	43 34.8	40.7	224 20.5	24.9	155 16.4	02.7	0 03.4	106	15 14.4	+ 85
3	46 56.3	269 13.1	·· 21.8	58 37.9	·· 40.8	239 22.5	·· 24.7	170 18.7	·· 02.8	14 33.0	106	·15 22.9	+ 85
4	61 58.8	284 12.8	21.2	73 40.9	40.8	254 24.4	24.5	185 21.0	02.9	29 02.6	104	15 31.4	+ 84
5	77 01.2	299 12.5	20.6	88 43.9	40.9	269 26.4	24.3	200 23.2	02.9	43 32.0	105	15 39.8	+ 83
6	92 03.7	314 12.2	+15 20.0	103 46.9	−10 40.9	284 28.4	+ 6 24.1	215 25.5	−18 03.0	58 01.5	103	+15 48.1	+ 83
7	107 06.1	329 11.9	19.4	118 50.0	40.9	299 30.3	23.9	230 27.8	03.0	72 30.8	103	15 56.4	+ 82
8	122 08.6	344 11.6	18.7	133 53.0	41.0	314 32.3	23.7	245 30.0	03.1	87 00.1	102	16 04.6	+ 81
9	137 11.1	359 11.3	·· 18.1	148 56.0	·· 41.0	329 34.3	·· 23.5	260 32.3	·· 03.1	101 29.3	102	·16 12.7	+ 80
10	152 13.5	14 11.0	17.5	163 59.0	41.1	344 36.2	23.3	275 34.5	03.2	115 58.5	100	16 20.7	+ 79
11	167 16.0	29 10.7	16.9	179 02.0	41.1	359 38.2	23.1	290 36.8	03.2	130 27.5	100	16 28.6	+ 79
12	182 18.5	44 10.4	+15 16.3	194 05.0	−10 41.1	14 40.2	+ 6 22.9	305 39.1	−18 03.3	144 56.5	100	+16 36.5	+ 77
13	197 20.9	59 10.1	15.7	209 08.1	41.2	29 42.2	22.7	320 41.3	03.3	159 25.5	99	16 44.2	+ 77
14	212 23.4	74 09.8	15.1	224 11.1	41.2	44 44.1	22.5	335 43.6	03.4	173 54.4	98	16 51.9	+ 76
15	227 25.9	89 09.6	·· 14.5	239 14.1	·· 41.2	59 46.1	·· 22.3	350 45.8	·· 03.4	188 23.2	97	·16 59.5	+ 75
16	242 28.3	104 09.3	13.8	254 17.1	41.3	74 48.1	22.1	5 48.1	03.5	202 51.9	97	17 07.0	+ 74
17	257 30.8	119 09.0	13.2	269 20.1	41.3	89 50.0	21.9	20 50.4	03.5	217 20.6	96	17 14.4	+ 73
18	272 33.3	134 08.7	+15 12.6	284 23.1	−10 41.3	104 52.0	+ 6 21.6	35 52.6	−18 03.6	231 49.2	96	+17 21.7	+ 73
19	287 35.7	149 08.4	12.0	299 26.1	41.4	119 54.0	21.4	50 54.9	03.6	246 17.8	95	17 29.0	+ 71
20	302 38.2	164 08.1	11.4	314 29.1	41.4	134 55.9	21.2	65 57.1	03.7	260 46.3	94	17 36.1	+ 71
21	317 40.6	179 07.8	·· 10.8	329 32.2	·· 41.4	149 57.9	·· 21.0	80 59.4	·· 03.7	275 14.7	93	·17 43.2	+ 69
22	332 43.1	194 07.5	10.1	344 35.2	41.5	164 59.9	20.8	96 01.7	03.8	289 43.0	93	17 50.1	+ 69
23	347 45.6	209 07.2	09.5	359 38.2	41.5	180 01.8	20.6	111 03.9	03.8	304 11.3	92	17 57.0	+ 68
24	2 48.0	224 06.9	+15 08.9	14 41.2	−10 41.5	195 03.8	+ 6 20.4	126 06.2	−18 03.9	318 39.5	92	+18 03.8	+ 66
code	—	− 3	− 6	+ 31	0	+ 19	− 2	+ 22	− 1				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
21 0	181 42.0	+ 0 48.3
1	196 42.2	47.3
2	211 42.5	46.3
3	226 42.7	·· 45.3
4	241 42.9	44.4
5	256 43.1	43.4
6	271 43.3	+ 0 42.4
7	286 43.6	41.4
8	301 43.8	40.5
9	316 44.0	·· 39.5
10	331 44.2	38.5
11	346 44.4	37.6
12	1 44.7	+ 0 36.6
13	16 44.9	35.6
14	31 45.1	34.6
15	46 45.3	·· 33.7
16	61 45.5	32.7
17	76 45.8	31.7
18	91 46.0	+ 0 30.8
19	106 46.2	29.8
20	121 46.4	28.8
21	136 46.6	·· 27.8
22	151 46.9	26.9
23	166 47.1	25.9
22 0	181 47.3	+ 0 24.9
1	196 47.5	23.9
2	211 47.8	23.0
3	226 48.0	·· 22.0
4	241 48.2	21.0
5	256 48.4	20.0
6	271 48.6	+ 0 19.1
7	286 48.9	18.1
8	301 49.1	17.1
9	316 49.3	·· 16.2
10	331 49.5	15.2
11	346 49.7	14.2
12	1 50.0	+ 0 13.2
13	16 50.2	12.3
14	31 50.4	11.3
15	46 50.6	·· 10.3
16	61 50.8	09.3
17	76 51.1	08.4
18	91 51.3	+ 0 07.4
19	106 51.5	06.4
20	121 51.7	05.4
21	136 51.9	·· 04.5
22	151 52.1	03.5
23	166 52.4	02.5
23 0	181 52.6	+ 0 01.6
1	196 52.8	+ 0 00.6
2	211 53.0	− 0 00.4
3	226 53.2	·· 01.4
4	241 53.5	02.3
5	256 53.7	03.3
6	271 53.9	− 0 04.3
7	286 54.1	05.3
8	301 54.3	06.2
9	316 54.6	·· 07.2
10	331 54.8	08.2
11	346 55.0	09.2
12	1 55.2	− 0 10.1
13	16 55.4	11.1
14	31 55.6	12.1
15	46 55.9	·· 13.1
16	61 56.1	14.0
17	76 56.3	15.0
18	91 56.5	− 0 16.0
19	106 56.7	16.9
20	121 57.0	17.9
21	136 57.2	·· 18.9
22	151 57.4	19.9
23	166 57.6	20.8
24	181 57.8	− 0 21.8
code	—	− 9

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 50.3	−40 28.4
5	Achernar	335 57.8	−57 27.1
30	Acrux	173 57.6	−62 51.6
19	Adhara	255 46.0	−28 54.5
10	Aldebaran	291 38.1	+16 25.5
32	Alioth	166 58.5	+56 11.7
34	Alkaid	153 32.8	+49 31.9
55	Al Na'ir	28 36.6	−47 10.2
15	Alnilam	276 29.5	− 1 13.6
25	Alphard	218 38.1	− 8 28.2
41	Alphecca	126 47.2	+26 51.8
1	Alpheratz	358 27.2	+28 51.3
51	Altair	62 49.6	+ 8 45.4
2	Ankaa	353 57.2	−42 32.2
42	Antares	113 18.6	−26 20.2
37	Arcturus	146 34.8	+19 24.6
43	Atria	108 58.8	−68 57.3
22	Avior	234 35.8	−59 22.0
13	Bellatrix	279 17.6	+ 6 18.8
16	Betelg'se	271 47.3	+ 7 24.1
17	Canopus	264 15.1	−52 40.0
12	Capella	281 37.2	+45 57.2
53	Deneb	50 00.2	+45 07.9
28	Denebola	183 17.3	+14 48.9
4	Diphda	349 38.2	−18 13.2
27	Dubhe	194 44.4	+61 59.0
14	Elnath	279 06.3	+28 34.3
47	Eltanin	91 05.9	+51 30.0
54	Enif	34 28.6	+ 9 40.8
56	Fomalhaut	16 10.5	−29 50.9
31	Gacrux	172 48.9	−56 52.3
29	Gienah	176 36.4	−17 18.1
35	Hadar	149 48.9	−60 10.0
6	Hamal	328 48.5	+23 15.6
48	Kaus Aust.	84 40.2	−34 24.4
40	Kochab	137 18.9	+74 20.2
57	Markab	14 20.4	+14 58.6
8	Menkar	314 59.3	+ 3 55.4
36	Menkent	148 58.1	−36 09.5
24	Miapl'dus	221 49.5	−69 32.2
9	Mirfak	309 41.0	+49 42.5
50	Nunki	76 50.9	−26 21.1
52	Peacock	54 25.8	−56 52.6
21	Pollux	244 19.8	+28 07.8
20	Procyon	245 44.4	+ 5 20.2
46	R'alhague	96 46.0	+12 35.7
26	Regulus	208 29.0	+12 10.8
11	Rigel	281 52.9	− 8 14.9
38	Rigil Kent.	140 50.4	−60 39.6
44	Sabik	103 01.4	−15 40.3
3	Schedar	350 28.5	+56 18.1
45	Shaula	97 19.7	−37 04.5
18	Sirius	259 11.3	−16 39.2
33	Spica	159 16.4	−10 56.1
23	Suhail	223 24.1	−43 15.3
49	Vega	81 07.7	+38 44.9
39	Zub'g'bi	137 52.8	−15 51.7

Lat.	Sunrise	Twlt. begins	Moonrise 21	22	23	24
N °	h m	h m	h m	h m	h m	h m
72	5 38	////	16 47	16 26	15 48	▭
70	5 40	1 21	17 02	16 52	16 40	16 12
68	5 41	2 01	17 14	17 12	17 12	17 15
66	5 42	2 28	17 24	17 28	17 36	17 50
64	5 43	2 47	17 32	17 41	17 55	18 16
62	5 43	3 03	17 40	17 52	18 10	18 36
60	5 44	3 15	17 46	18 02	18 23	18 53
58	5 45	3 25	17 52	18 10	18 35	19 06
56	5 45	3 34	17 57	18 18	18 44	19 18
54	5 45	3 43	18 01	18 24	18 53	19 29
52	5 46	3 49	18 05	18 30	19 01	19 38
50	5 46	3 55	18 09	18 36	19 08	19 47
45	5 47	4 07	18 17	18 48	19 23	20 04
40	5 47	4 15	18 24	18 57	19 35	20 19
35	5 48	4 22	18 30	19 06	19 46	20 31
30	5 48	4 28	18 35	19 13	19 55	20 42
20	5 49	4 36	18 44	19 26	20 11	21 01
10	5 49	4 39	18 52	19 37	20 26	21 17
0	5 49	4 41	19 00	19 48	20 39	21 33
10	5 50	4 40	19 07	19 58	20 52	21 48
20	5 50	4 38	19 15	20 10	21 07	22 04
30	5 50	4 31	19 25	20 23	21 23	22 23
35	5 49	4 26	19 30	20 31	21 33	22 35
40	5 49	4 20	19 36	20 40	21 44	22 47
45	5 49	4 12	19 44	20 50	21 57	23 02
50	5 49	4 01	19 52	21 03	22 13	23 21
52	5 49	3 56	19 56	21 08	22 20	23 30
54	5 49	3 50	20 01	21 15	22 29	23 40
56	5 49	3 43	20 06	21 22	22 38	23 51
58	5 48	3 35	20 11	21 30	22 49	24 04
60	5 48	3 26	20 18	21 39	23 01	24 19
S						

Lat.	Sunset	Twlt. ends	Moonset 21	22	23	24
N °	h m	h m	h m	h m	h m	h m
72	18 05	////	8 26	10 25	12 48	▭
70	18 03	22 12	8 13	10 01	11 57	14 16
68	18 02	21 35	8 02	9 42	11 26	13 13
66	18 02	21 11	7 54	9 27	11 03	12 39
64	18 01	20 52	7 47	9 15	10 45	12 14
62	18 00	20 37	7 40	9 05	10 30	11 54
60	18 00	20 26	7 35	8 56	10 18	11 38
58	17 59	20 15	7 30	8 48	10 07	11 24
56	17 59	20 07	7 26	8 42	9 58	11 13
54	17 59	20 00	7 22	8 36	9 50	11 03
52	17 59	19 54	7 19	8 30	9 42	10 53
50	17 58	19 48	7 16	8 26	9 36	10 45
45	17 58	19 37	7 09	8 15	9 22	10 28
40	17 57	19 28	7 04	8 06	9 10	10 14
35	17 57	19 22	6 59	7 59	9 00	10 02
30	17 57	19 17	6 55	7 53	8 52	9 52
20	17 56	19 09	6 48	7 41	8 37	9 34
10	17 56	19 06	6 41	7 32	8 24	9 19
0	17 56	19 05	6 35	7 22	8 12	9 04
10	17 56	19 06	6 29	7 13	8 00	8 50
20	17 56	19 09	6 23	7 03	7 47	8 34
30	17 56	19 16	6 16	6 52	7 32	8 17
35	17 56	19 21	6 12	6 46	7 24	8 07
40	17 57	19 28	6 07	6 39	7 14	7 55
45	17 57	19 36	6 02	6 30	7 03	7 41
50	17 57	19 47	5 55	6 20	6 49	7 24
52	17 57	19 52	5 52	6 16	6 43	7 16
54	17 58	19 59	5 49	6 11	6 36	7 08
56	17 58	20 06	5 46	6 05	6 28	6 58
58	17 58	20 15	5 42	5 59	6 19	6 47
60	17 58	20 24	5 37	5 51	6 09	6 34
S						

GMT	Equation of Time (App. Mean) 21	22	23
h	m s	m s	m s
0	+ 6 47.6	+ 7 08.8	+ 7 29.9
6	+ 6 52.9	+ 7 14.1	+ 7 35.2
12	+ 6 58.2	+ 7 19.4	+ 7 40.4
18	+ 7 03.5	+ 7 24.6	+ 7 45.6
24	+ 7 08.8	+ 7 29.9	+ 7 50.9

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
21	0 24	9 02	23 11	11 08	15 44
22	1 11	9 03	23 06	11 05	15 41
23	2 00	9 03	23 02	11 01	15 37
24	2 52	9 04	22 57	10 58	15 33

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.3	0.2	0.4
30	0.3	0.1	0.3
45	0.3	0.1	0.2
60	0.3	0.1	0.1
75	0.3	0.0	0.0
90			

Moon's Lower Limb — Add

Alt.	21	22	23
°	′	′	′
0	14.4	15.0	15.7
4	14.4	15.0	15.7
8	14.4	15.0	15.7
12	14.4	15.1	15.7
16	14.4	15.1	15.7
20	14.5	15.1	15.7
24	14.5	15.1	15.7
28	14.5	15.1	15.7
32	14.6	15.1	15.7
36	14.6	15.1	15.7
40	14.6	15.1	15.7
44	14.7	15.2	15.6
48	14.7	15.2	15.6
52	14.8	15.2	15.6
56	14.8	15.2	15.6
60	14.9	15.3	15.6
64	14.9	15.3	15.6
68	15.0	15.3	15.6
72	15.1	15.3	15.6
76	15.1	15.4	15.6
80	15.2	15.4	15.6
84	15.2	15.4	15.6
88	15.3	15.4	15.6
90			

Add to table, back cover

Moon's Upper Limb — Subtract

Alt.	21	22	23
°	′	′	′
0	16.2	15.8	15.5
4	16.2	15.8	15.5
8	16.2	15.8	15.5
12	16.2	15.8	15.5
16	16.2	15.8	15.5
20	16.1	15.8	15.5
24	16.1	15.8	15.5
28	16.1	15.8	15.5
32	16.1	15.8	15.5
36	16.0	15.8	15.5
40	16.0	15.7	15.5
44	15.9	15.7	15.5
48	15.9	15.7	15.5
52	15.8	15.7	15.5
56	15.8	15.7	15.5
60	15.7	15.6	15.5
64	15.7	15.6	15.5
68	15.6	15.6	15.5
72	15.6	15.6	15.6
76	15.5	15.5	15.6
80	15.4	15.5	15.6
84	15.4	15.5	15.6
88	15.3	15.4	15.6
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.8 GHA	VENUS −3.8 Dec.	MARS −2.4 GHA	MARS −2.4 Dec.	JUPITER −1.2 GHA	JUPITER −1.2 Dec.	SATURN 0.8 GHA	SATURN 0.8 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
24 0	2 48.0	224 06.9	+15 08.9	14 41.2	−10 41.5	195 03.8	+ 6 20.4	126 06.2	−18 03.9	318 39.5	92	+18 03.8	+ 66
1	17 50.5	239 06.6	08.3	29 44.2	41.6	210 05.8	20.2	141 08.4	03.9	333 07.7	90	18 10.4	+ 66
2	32 53.0	254 06.3	07.7	44 47.2	41.6	225 07.7	20.0	156 10.7	04.0	347 35.7	91	18 17.0	+ 65
3	47 55.4	269 06.0	·· 07.0	59 50.2	·· 41.6	240 09.7	·· 19.8	171 13.0	·· 04.0	2 03.8	89	·18 23.5	+ 63
4	62 57.9	284 05.7	06.4	74 53.2	41.6	255 11.7	19.6	186 15.2	04.1	16 31.7	89	18 29.8	+ 63
5	78 00.4	299 05.4	05.8	89 56.2	41.7	270 13.7	19.4	201 17.5	04.1	30 59.6	88	18 36.1	+ 62
6	93 02.8	314 05.1	+15 05.2	104 59.2	−10 41.7	285 15.6	+ 6 19.2	216 19.7	−18 04.2	45 27.4	88	+18 42.3	+ 60
7	108 05.3	329 04.8	04.5	120 02.2	41.7	300 17.6	19.0	231 22.0	04.2	59 55.2	87	18 48.3	+ 60
8	123 07.7	344 04.5	03.9	135 05.2	41.8	315 19.6	18.8	246 24.3	04.3	74 22.9	86	18 54.3	+ 59
9	138 10.2	359 04.2	·· 03.3	150 08.2	·· 41.8	330 21.5	·· 18.6	261 26.5	·· 04.3	88 50.5	86	·19 00.2	+ 57
10	153 12.7	14 03.9	02.6	165 11.2	41.8	345 23.5	18.4	276 28.8	04.4	103 18.1	85	19 05.9	+ 57
11	168 15.1	29 03.6	02.0	180 14.2	41.8	0 25.5	18.2	291 31.0	04.5	117 45.6	84	19 11.6	+ 55
12	183 17.6	44 03.3	+15 01.4	195 17.2	−10 41.9	15 27.4	+ 6 18.0	306 33.3	−18 04.5	132 13.0	84	+19 17.1	+ 54
13	198 20.1	59 03.0	00.8	210 20.2	41.9	30 29.4	17.8	321 35.6	04.6	146 40.4	84	19 22.5	+ 54
14	213 22.5	74 02.7	15 00.1	225 23.2	41.9	45 31.4	17.6	336 37.8	04.6	161 07.8	82	19 27.9	+ 52
15	228 25.0	89 02.4	·14 59.5	240 26.2	·· 41.9	60 33.4	·· 17.4	351 40.1	·· 04.7	175 35.0	82	·19 33.1	+ 51
16	243 27.5	104 02.1	58.9	255 29.2	41.9	75 35.3	17.2	6 42.3	04.7	190 02.2	82	19 38.2	+ 50
17	258 29.9	119 01.8	58.2	270 32.2	42.0	90 37.3	17.0	21 44.6	04.8	204 29.4	80	19 43.2	+ 49
18	273 32.4	134 01.5	+14 57.6	285 35.1	−10 42.0	105 39.3	+ 6 16.8	36 46.8	−18 04.8	218 56.4	81	+19 48.1	+ 47
19	288 34.9	149 01.2	57.0	300 38.1	42.0	120 41.2	16.5	51 49.1	04.9	233 23.5	79	19 52.8	+ 47
20	303 37.3	164 00.9	56.3	315 41.1	42.0	135 43.2	16.3	66 51.4	04.9	247 50.4	80	19 57.5	+ 45
21	318 39.8	179 00.6	·· 55.7	330 44.1	·· 42.0	150 45.2	·· 16.1	81 53.6	·· 05.0	262 17.4	78	·20 02.0	+ 44
22	333 42.2	194 00.3	55.0	345 47.1	42.1	165 47.1	15.9	96 55.9	05.0	276 44.2	78	20 06.4	+ 43
23	348 44.7	209 00.0	54.4	0 50.1	42.1	180 49.1	15.7	111 58.1	05.1	291 11.0	78	20 10.7	+ 42
25 0	3 47.2	223 59.7	+14 53.8	15 53.1	−10 42.1	195 51.1	+ 6 15.5	127 00.4	−18 05.1	305 37.8	76	+20 14.9	+ 41
1	18 49.6	238 59.4	53.1	30 56.0	42.1	210 53.0	15.3	142 02.6	05.2	320 04.4	77	20 19.0	+ 39
2	33 52.1	253 59.1	52.5	45 59.0	42.1	225 55.0	15.1	157 04.9	05.2	334 31.1	76	20 22.9	+ 39
3	48 54.6	268 58.8	·· 51.8	61 02.0	·· 42.2	240 57.0	·· 14.9	172 07.2	·· 05.3	348 57.7	75	·20 26.8	+ 37
4	63 57.0	283 58.5	51.2	76 05.0	42.2	255 59.0	14.7	187 09.4	05.3	3 24.2	75	20 30.5	+ 36
5	78 59.5	298 58.2	50.5	91 08.0	42.2	271 00.9	14.5	202 11.7	05.4	17 50.7	74	20 34.1	+ 34
6	94 02.0	313 57.9	+14 49.9	106 11.0	−10 42.2	286 02.9	+ 6 14.3	217 13.9	−18 05.4	32 17.1	74	+20 37.5	+ 34
7	109 04.4	328 57.6	49.3	121 13.9	42.2	301 04.9	14.1	232 16.2	05.5	46 43.5	73	20 40.9	+ 32
8	124 06.9	343 57.3	48.6	136 16.9	42.2	316 06.8	13.9	247 18.4	05.5	61 09.8	73	20 44.1	+ 31
9	139 09.4	358 57.0	·· 48.0	151 19.9	·· 42.2	331 08.8	·· 13.7	262 20.7	·· 05.6	75 36.1	72	·20 47.2	+ 30
10	154 11.8	13 56.7	47.3	166 22.9	42.2	346 10.8	13.5	277 22.9	05.7	90 02.3	72	20 50.2	+ 28
11	169 14.3	28 56.4	46.7	181 25.8	42.3	1 12.8	13.3	292 25.2	05.7	104 28.5	72	20 53.0	+ 27
12	184 16.7	43 56.1	+14 46.0	196 28.8	−10 42.3	16 14.7	+ 6 13.1	307 27.5	−18 05.8	118 54.7	71	+20 55.7	+ 26
13	199 19.2	58 55.8	45.4	211 31.8	42.3	31 16.7	12.9	322 29.7	05.8	133 20.8	70	20 58.3	+ 25
14	214 21.7	73 55.5	44.7	226 34.8	42.3	46 18.7	12.7	337 32.0	05.9	147 46.8	70	21 00.8	+ 23
15	229 24.1	88 55.2	·· 44.1	241 37.7	·· 42.3	61 20.6	·· 12.5	352 34.2	·· 05.9	162 12.8	70	·21 03.1	+ 22
16	244 26.6	103 54.9	43.4	256 40.7	42.3	76 22.6	12.3	7 36.5	06.0	176 38.8	69	21 05.3	+ 21
17	259 29.1	118 54.6	42.8	271 43.7	42.3	91 24.6	12.1	22 38.7	06.0	191 04.7	69	21 07.4	+ 19
18	274 31.5	133 54.3	+14 42.1	286 46.6	−10 42.3	106 26.5	+ 6 11.9	37 41.0	−18 06.1	205 30.6	69	+21 09.3	+ 19
19	289 34.0	148 54.0	41.5	301 49.6	42.3	121 28.5	11.7	52 43.2	06.1	219 56.5	68	21 11.2	+ 17
20	304 36.5	163 53.7	40.8	316 52.6	42.3	136 30.5	11.5	67 45.5	06.2	234 22.3	68	21 12.9	+ 15
21	319 38.9	178 53.4	·· 40.1	331 55.5	·· 42.3	151 32.5	·· 11.3	82 47.7	·· 06.2	248 48.1	67	·21 14.4	+ 14
22	334 41.4	193 53.1	39.5	346 58.5	42.4	166 34.4	11.0	97 50.0	06.3	263 13.8	67	21 15.8	+ 13
23	349 43.8	208 52.8	38.8	2 01.5	42.4	181 36.4	10.8	112 52.3	06.3	277 39.5	67	21 17.1	+ 12
26 0	4 46.3	223 52.5	+14 38.2	17 04.4	−10 42.4	196 38.4	+ 6 10.6	127 54.5	−18 06.4	292 05.2	66	+21 18.3	+ 10
1	19 48.8	238 52.2	37.5	32 07.4	42.4	211 40.3	10.4	142 56.8	06.4	306 30.8	66	21 19.3	+ 9
2	34 51.2	253 51.9	36.8	47 10.3	42.4	226 42.3	10.2	157 59.0	06.5	320 56.4	66	21 20.2	+ 8
3	49 53.7	268 51.6	·· 36.2	62 13.3	·· 42.4	241 44.3	·· 10.0	173 01.3	·· 06.5	335 22.0	66	·21 21.0	+ 6
4	64 56.2	283 51.2	35.5	77 16.3	42.4	256 46.3	09.8	188 03.5	06.6	349 47.6	65	21 21.6	+ 5
5	79 58.6	298 50.9	34.9	92 19.2	42.4	271 48.2	09.6	203 05.8	06.7	4 13.1	65	21 22.1	+ 4
6	95 01.1	313 50.6	+14 34.2	107 22.2	−10 42.4	286 50.2	+ 6 09.4	218 08.0	−18 06.7	18 38.6	65	+21 22.5	+ 2
7	110 03.6	328 50.3	33.5	122 25.1	42.4	301 52.2	09.2	233 10.3	06.8	33 04.1	64	21 22.7	+ 1
8	125 06.0	343 50.0	32.9	137 28.1	42.4	316 54.1	09.0	248 12.5	06.8	47 29.5	64	21 22.8	− 1
9	140 08.5	358 49.7	·· 32.2	152 31.0	·· 42.4	331 56.1	·· 08.8	263 14.8	·· 06.9	61 54.9	64	·21 22.7	− 2
10	155 11.0	13 49.4	31.5	167 34.0	42.4	346 58.1	08.6	278 17.0	06.9	76 20.3	64	21 22.5	− 3
11	170 13.4	28 49.1	30.9	182 36.9	42.4	2 00.1	08.4	293 19.3	07.0	90 45.7	64	21 22.2	− 4
12	185 15.9	43 48.8	+14 30.2	197 39.9	−10 42.4	17 02.0	+ 6 08.2	308 21.5	−18 07.0	105 11.1	63	+21 21.8	− 6
13	200 18.3	58 48.5	29.5	212 42.8	42.4	32 04.0	08.0	323 23.8	07.1	119 36.4	63	21 21.2	− 7
14	215 20.8	73 48.2	28.9	227 45.8	42.4	47 06.0	07.8	338 26.0	07.1	134 01.7	64	21 20.5	− 9
15	230 23.3	88 47.9	·· 28.2	242 48.7	·· 42.4	62 07.9	·· 07.6	353 28.3	·· 07.2	148 27.1	62	·21 19.6	− 10
16	245 25.7	103 47.6	27.5	257 51.7	42.4	77 09.9	07.4	8 30.6	07.2	162 52.3	63	21 18.6	− 11
17	260 28.2	118 47.3	26.8	272 54.6	42.4	92 11.9	07.2	23 32.8	07.3	177 17.6	63	21 17.5	− 13
18	275 30.7	133 47.0	+14 26.2	287 57.6	−10 42.4	107 13.9	+ 6 07.0	38 35.1	−18 07.3	191 42.9	62	+21 16.2	− 14
19	290 33.1	148 46.7	25.5	303 00.5	42.3	122 15.8	06.8	53 37.3	07.4	206 08.1	63	21 14.8	− 16
20	305 35.6	163 46.4	24.8	318 03.5	42.3	137 17.8	06.6	68 39.6	07.4	220 33.4	62	21 13.2	− 17
21	320 38.1	178 46.1	·· 24.2	333 06.4	·· 42.3	152 19.8	·· 06.4	83 41.8	·· 07.5	234 58.6	62	·21 11.5	− 18
22	335 40.5	193 45.8	23.5	348 09.3	42.3	167 21.7	06.2	98 44.1	07.5	249 23.8	63	21 09.7	− 19
23	350 43.0	208 45.5	22.8	3 12.3	42.3	182 23.7	06.0	113 46.3	07.6	263 49.1	62	21 07.8	− 21
24	5 45.5	223 45.2	+14 22.1	18 15.2	−10 42.3	197 25.7	+ 6 05.8	128 48.6	−18 07.7	278 14.3	62	+21 05.7	− 23
code	—	− 3	− 6	+ 30	0	+ 20	− 2	+ 22	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
24 0	181 57.8	− 0 21.8	7	Acamar	315 50.3	−40 28.4
1	196 58.0	22.8	5	Achernar	335 57.8	−57 27.1
2	211 58.3	23.8	30	Acrux	173 57.6	−62 51.6
3	226 58.5	·· 24.7	19	Adhara	255 46.0	−28 54.5
4	241 58.7	25.7	10	Aldebaran	291 38.1	+16 25.5
5	256 58.9	26.7				
6	271 59.1	− 0 27.7	32	Alioth	166 58.5	+56 11.7
7	286 59.3	28.6	34	Alkaid	153 32.8	+49 31.8
8	301 59.6	29.6	55	Al Na'ir	28 36.6	−47 10.2
9	316 59.8	·· 30.6	15	Alnilam	276 29.5	− 1 13.6
10	332 00.0	31.6	25	Alphard	218 38.1	− 8 28.2
11	347 00.2	32.5				
12	2 00.4	− 0 33.5	41	Alphecca	126 47.2	+26 51.8
13	17 00.7	34.5	1	Alpheratz	358 27.2	+28 51.3
14	32 00.9	35.5	51	Altair	62 49.6	+ 8 45.4
15	47 01.1	·· 36.4	2	Ankaa	353 57.2	−42 32.2
16	62 01.3	37.4	42	Antares	113 18.6	−26 20.2
17	77 01.5	38.4				
18	92 01.7	− 0 39.4	37	Arcturus	146 34.8	+19 24.5
19	107 01.9	40.3	43	Atria	108 58.8	−68 57.3
20	122 02.2	41.3	22	Avior	234 35.8	−59 22.0
21	137 02.4	·· 42.3	13	Bellatrix	279 17.6	+ 6 18.8
22	152 02.6	43.3	16	Betelg'se	271 47.3	+ 7 24.1
23	167 02.8	44.2				
			17	Canopus	264 15.1	−52 40.0
25 0	182 03.0	− 0 45.2	12	Capella	281 37.2	+45 57.2
1	197 03.2	46.2	53	Deneb	50 00.2	+45 07.9
2	212 03.5	47.1	28	Denebola	183 17.3	+14 48.9
3	227 03.7	·· 48.1	4	Diphda	349 38.2	−18 13.2
4	242 03.9	49.1				
5	257 04.1	50.1	27	Dubhe	194 44.4	+61 59.0
6	272 04.3	− 0 51.0	14	Elnath	279 06.3	+28 34.3
7	287 04.5	52.0	47	Eltanin	91 05.9	+51 30.0
8	302 04.8	53.0	54	Enif	34 28.6	+ 9 40.8
9	317 05.0	·· 54.0	56	Fomalhaut	16 10.5	−29 50.9
10	332 05.2	54.9				
11	347 05.4	55.9	31	Gacrux	172 48.9	−56 52.3
12	2 05.6	− 0 56.9	29	Gienah	176 36.4	−17 18.1
13	17 05.8	57.9	35	Hadar	149 48.9	−60 10.0
14	32 06.0	58.8	6	Hamal	328 48.5	+23 15.6
15	47 06.3	· 0 59.8	48	Kaus Aust.	84 40.2	−34 24.4
16	62 06.5	1 00.8				
17	77 06.7	01.8	40	Kochab	137 18.9	+74 20.1
18	92 06.9	− 1 02.7	57	Markab	14 20.4	+14 58.6
19	107 07.1	03.7	8	Menkar	314 59.3	+ 3 55.4
20	122 07.3	04.7	36	Menkent	148 58.1	−36 09.5
21	137 07.5	·· 05.7	24	Miapl'dus	221 49.4	−69 32.2
22	152 07.8	06.6				
23	167 08.0	07.6	9	Mirfak	309 41.0	+49 42.5
			50	Nunki	76 50.9	−26 21.1
26 0	182 08.2	− 1 08.6	52	Peacock	54 25.8	−56 52.6
1	197 08.4	09.6	21	Pollux	244 19.8	+28 07.8
2	212 08.6	10.5	20	Procyon	245 44.3	+ 5 20.2
3	227 08.8	·· 11.5				
4	242 09.0	12.5	46	R'alhague	96 46.0	+12 35.7
5	257 09.3	13.5	26	Regulus	208 29.0	+12 10.7
6	272 09.5	− 1 14.4	11	Rigel	281 52.9	− 8 14.9
7	287 09.7	15.4	38	Rigil Kent.	140 50.4	−60 39.6
8	302 09.9	16.4	44	Sabik	103 01.4	−15 40.3
9	317 10.1	·· 17.4				
10	332 10.3	18.3	3	Schedar	350 28.5	+56 18.2
11	347 10.5	19.3	45	Shaula	97 19.7	−37 04.5
12	2 10.8	− 1 20.3	18	Sirius	259 11.2	−16 39.2
13	17 11.0	21.3	33	Spica	159 16.4	−10 56.1
14	32 11.2	22.2	23	Suhail	223 24.1	−43 15.3
15	47 11.4	·· 23.2				
16	62 11.6	24.2	49	Vega	81 07.7	+38 44.9
17	77 11.8	25.2	39	Zub'g'bi	137 52.8	−15 51.7
18	92 12.0	− 1 26.1				
19	107 12.2	27.1				
20	122 12.4	28.1				
21	137 12.7	·· 29.0				
22	152 12.9	30.0				
23	167 13.1	31.0				
24	182 13.3	− 1 32.0				
code	—	− 10				

Lat. N °	Sunrise h m	Twlt. begins h m	Moonrise 24 h m	25 h m	26 h m	27 h m
72	5 52	0 55	□	□	□	□
70	5 52	1 49	16 12	□	□	18 36
68	5 52	2 20	17 15	17 29	18 22	20 02
66	5 51	2 42	17 50	18 20	19 16	20 41
64	5 51	2 59	18 16	18 52	19 48	21 08
62	5 51	3 13	18 36	19 15	20 13	21 28
60	5 51	3 25	18 53	19 34	20 32	21 45
58	5 51	3 34	19 06	19 50	20 48	21 59
56	5 51	3 42	19 18	20 04	21 01	22 11
54	5 51	3 49	19 29	20 15	21 13	22 22
52	5 51	3 55	19 38	20 25	21 23	22 31
50	5 51	4 00	19 47	20 35	21 33	22 40
45	5 51	4 10	20 04	20 54	21 52	22 57
40	5 50	4 18	20 19	21 10	22 08	23 12
35	5 50	4 25	20 31	21 23	22 21	23 24
30	5 50	4 29	20 42	21 35	22 33	23 35
20	5 49	4 36	21 01	21 55	22 53	23 53
10	5 49	4 39	21 17	22 12	23 10	24 09
0	5 48	4 40	21 33	22 29	23 26	24 24
10	5 48	4 38	21 48	22 45	23 43	24 39
20	5 47	4 35	22 04	23 03	24 00	0 00
30	5 46	4 27	22 23	23 23	24 20	0 20
35	5 45	4 22	22 35	23 35	24 32	0 32
40	5 44	4 15	22 47	23 48	24 45	0 45
45	5 43	4 06	23 02	24 05	0 05	1 01
50	5 42	3 55	23 21	24 25	0 25	1 20
52	5 42	3 48	23 30	24 34	0 34	1 30
54	5 41	3 42	23 40	24 45	0 45	1 40
56	5 41	3 34	23 51	24 57	0 57	1 52
58	5 40	3 25	24 04	0 04	1 11	2 05
60 S	5 39	3 14	24 19	0 19	1 27	2 21

Lat. N °	Sunset h m	Twlt. ends h m	Moonset 24 h m	25 h m	26 h m	27 h m
72	17 49	22 31	□	□	□	□
70	17 49	21 44	14 16	□	□	17 50
68	17 50	21 15	13 13	14 55	16 02	16 23
66	17 50	20 54	12 39	14 05	15 08	15 44
64	17 50	20 38	12 14	13 33	14 36	15 17
62	17 51	20 26	11 54	13 10	14 12	14 56
60	17 51	20 15	11 38	12 51	13 52	14 39
58	17 51	20 06	11 24	12 35	13 36	14 24
56	17 51	19 58	11 13	12 22	13 23	14 12
54	17 51	19 51	11 03	12 11	13 11	14 01
52	17 51	19 45	10 53	12 00	13 01	13 52
50	17 52	19 41	10 45	11 51	12 51	13 43
45	17 52	19 30	10 28	11 32	12 32	13 24
40	17 52	19 22	10 14	11 17	12 16	13 09
35	17 53	19 17	10 02	11 03	12 02	12 57
30	17 53	19 13	9 52	10 52	11 50	12 46
20	17 54	19 07	9 34	10 32	11 30	12 26
10	17 54	19 04	9 19	10 15	11 13	12 10
0	17 55	19 04	9 04	9 59	10 56	11 54
10	17 56	19 06	8 50	9 43	10 40	11 38
20	17 57	19 10	8 34	9 26	10 22	11 21
30	17 58	19 18	8 17	9 06	10 02	11 02
35	17 59	19 24	8 07	8 55	9 50	10 51
40	18 00	19 31	7 55	8 42	9 36	10 37
45	18 01	19 41	7 41	8 26	9 20	10 22
50	18 02	19 53	7 24	8 07	9 00	10 03
52	18 02	19 58	7 16	7 58	8 51	9 54
54	18 03	20 06	7 08	7 48	8 40	9 43
56	18 04	20 14	6 58	7 37	8 28	9 32
58	18 05	20 23	6 47	7 24	8 14	9 19
60 S	18 06	20 34	6 34	7 09	7 57	9 03

GMT h	Equation of Time (App. Mean) 24 m s	25 m s	26 m s
0	+ 7 50.9	+ 8 11.7	+ 8 32.3
6	+ 7 56.1	+ 8 16.9	+ 8 37.5
12	+ 8 01.3	+ 8 22.0	+ 8 42.6
18	+ 8 06.5	+ 8 27.2	+ 8 47.7
24	+ 8 11.7	+ 8 32.3	+ 8 52.8

GMT of Transit
Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
24	2 52	9 04	22 57	10 58	15 33
25	3 46	9 04	22 52	10 55	15 30
26	4 43	9 05	22 47	10 52	15 26
27	5 40	9 05	22 43	10 49	15 22

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.3	0.2	0.4
30	0.3	0.1	0.3
45	0.3	0.1	0.2
60	0.3	0.1	0.1
75	0.3	0.0	0.0
90			

Moon's Lower Limb Add

Alt. °	24 ′	25 ′	26 ′
0	16.3	16.9	17.6
4	16.3	16.9	17.6
8	16.3	16.9	17.6
12	16.3	16.9	17.5
16	16.3	16.9	17.5
20	16.3	16.9	17.5
24	16.3	16.8	17.4
28	16.2	16.8	17.4
32	16.2	16.8	17.3
36	16.2	16.7	17.2
40	16.2	16.7	17.2
44	16.1	16.6	17.1
48	16.1	16.6	17.0
52	16.1	16.5	16.9
56	16.0	16.4	16.8
60	16.0	16.4	16.7
64	16.0	16.3	16.6
68	15.9	16.2	16.5
72	15.9	16.2	16.4
76	15.8	16.1	16.3
80	15.8	16.0	16.2
84	15.8	15.9	16.1
88	15.7	15.9	16.0
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt. °	24 ′	25 ′	26 ′
0	15.1	14.8	14.4
4	15.1	14.8	14.4
8	15.1	14.8	14.4
12	15.1	14.8	14.4
16	15.1	14.8	14.5
20	15.2	14.8	14.5
24	15.2	14.9	14.5
28	15.2	14.9	14.6
32	15.2	14.9	14.7
36	15.2	15.0	14.7
40	15.3	15.0	14.8
44	15.3	15.1	14.9
48	15.3	15.1	15.0
52	15.4	15.2	15.0
56	15.4	15.3	15.1
60	15.4	15.3	15.2
64	15.5	15.4	15.3
68	15.5	15.5	15.4
72	15.5	15.5	15.5
76	15.6	15.6	15.7
80	15.6	15.7	15.8
84	15.7	15.8	15.9
88	15.7	15.8	16.0
90			

Subtract from table, back cover

G M T	♈ GHA	VENUS −3.8 GHA	Dec	MARS −2.3 GHA	Dec.	JUPITER −1.2 GHA	Dec.	SATURN 0.8 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
27 0	5 45.5	223 45.2	+14 22.1	18 15.2	−10 42.3	197 25.7	+ 6 05.8	128 48.6	−18 07.7	278 14.3	62	+21 05.7	− 23
1	20 47.9	238 44.9	21.4	33 18.2	42.3	212 27.7	05.6	143 50.8	07.7	292 39.5	62	21 03.4	− 23
2	35 50.4	253 44.6	20.8	48 21.1	42.3	227 29.6	05.4	158 53.1	07.8	307 04.7	62	21 01.1	− 25
3	50 52.8	268 44.2	·· 20.1	63 24.0	·· 42.3	242 31.6	·· 05.2	173 55.3	·· 07.8	321 29.9	62	·20 58.6	− 27
4	65 55.3	283 43.9	19.4	78 27.0	42.3	257 33.6	04.9	188 57.6	07.9	335 55.1	62	20 55.9	− 28
5	80 57.8	298 43.6	18.7	93 29.9	42.3	272 35.6	04.7	203 59.8	07.9	350 20.3	62	20 53.1	− 29
6	96 00.2	313 43.3	+14 18.0	108 32.8	−10 42.2	287 37.5	+ 6 04.5	219 02.1	−18 08.0	4 45.5	62	+20 50.2	− 30
7	111 02.7	328 43.0	17.4	123 35.8	42.2	302 39.5	04.3	234 04.3	08.0	19 10.7	62	20 47.2	− 32
8	126 05.2	343 42.7	16.7	138 38.7	42.2	317 41.5	04.1	249 06.6	08.1	33 35.9	62	20 44.0	− 34
9	141 07.6	358 42.4	·· 16.0	153 41.6	·· 42.2	332 43.4	·· 03.9	264 08.8	·· 08.1	48 01.1	62	·20 40.6	− 34
10	156 10.1	13 42.1	15.3	168 44.6	42.2	347 45.4	03.7	279 11.1	08.2	62 26.3	62	20 37.2	− 36
11	171 12.6	28 41.8	14.6	183 47.5	42.2	2 47.4	03.5	294 13.3	08.2	76 51.5	62	20 33.6	− 37
12	186 15.0	43 41.5	+14 13.9	198 50.4	−10 42.2	17 49.4	+ 6 03.3	309 15.6	−18 08.3	91 16.7	63	+20 29.9	− 39
13	201 17.5	58 41.2	13.2	213 53.3	42.1	32 51.3	03.1	324 17.8	08.3	105 42.0	62	20 26.0	− 40
14	216 19.9	73 40.9	12.6	228 56.3	42.1	47 53.3	02.9	339 20.1	08.4	120 07.2	63	20 22.0	− 41
15	231 22.4	88 40.6	·· 11.9	243 59.2	·· 42.1	62 55.3	·· 02.7	354 22.3	·· 08.5	134 32.5	62	·20 17.9	− 43
16	246 24.9	103 40.3	11.2	259 02.1	42.1	77 57.3	02.5	9 24.6	08.5	148 57.7	63	20 13.6	− 44
17	261 27.3	118 40.0	10.5	274 05.0	42.1	92 59.2	02.3	24 26.8	08.6	163 23.0	63	20 09.2	− 45
18	276 29.8	133 39.7	+14 09.8	289 07.9	−10 42.1	108 01.2	+ 6 02.1	39 29.1	−18 08.6	177 48.3	63	+20 04.7	− 47
19	291 32.3	148 39.4	09.1	304 10.9	42.0	123 03.2	01.9	54 31.3	08.7	192 13.6	63	20 00.0	− 48
20	306 34.7	163 39.0	08.4	319 13.8	42.0	138 05.1	01.7	69 33.6	08.7	206 38.9	64	19 55.2	− 49
21	321 37.2	178 38.7	·· 07.7	334 16.7	·· 42.0	153 07.1	·· 01.5	84 35.8	·· 08.8	221 04.3	63	·19 50.3	− 51
22	336 39.7	193 38.4	07.0	349 19.6	42.0	168 09.1	01.3	99 38.1	08.8	235 29.6	64	19 45.2	− 52
23	351 42.1	208 38.1	06.3	4 22.5	42.0	183 11.1	01.1	114 40.3	08.9	249 55.0	64	19 40.0	− 53
28 0	6 44.6	223 37.8	+14 05.6	19 25.4	−10 41.9	198 13.0	+ 6 00.9	129 42.6	−18 08.9	264 20.4	64	+19 34.7	− 54
1	21 47.1	238 37.5	04.9	34 28.4	41.9	213 15.0	00.7	144 44.8	09.0	278 45.8	65	19 29.3	− 56
2	36 49.5	253 37.2	04.2	49 31.3	41.9	228 17.0	00.5	159 47.0	09.0	293 11.3	64	19 23.7	− 57
3	51 52.0	268 36.9	·· 03.5	64 34.2	·· 41.9	243 19.0	·· 00.3	174 49.3	·· 09.1	307 36.7	65	·19 18.0	− 58
4	66 54.4	283 36.6	02.8	79 37.1	41.8	258 20.9	6 00.1	189 51.5	09.1	322 02.2	65	19 12.2	− 60
5	81 56.9	298 36.3	02.1	94 40.0	41.8	273 22.9	5 59.9	204 53.8	09.2	336 27.7	65	19 06.2	− 61
6	96 59.4	313 36.0	+14 01.4	109 42.9	−10 41.8	288 24.9	+ 5 59.7	219 56.0	−18 09.3	350 53.2	66	+19 00.1	− 62
7	112 01.8	328 35.7	00.7	124 45.8	41.8	303 26.9	59.5	234 58.3	09.3	5 18.8	66	18 53.9	− 63
8	127 04.3	343 35.4	14 00.0	139 48.7	41.7	318 28.8	59.3	250 00.5	09.4	19 44.4	66	18 47.6	− 65
9	142 06.8	358 35.1	·13 59.3	154 51.6	·· 41.7	333 30.8	·· 59.1	265 02.8	·· 09.4	34 10.0	66	·18 41.1	− 66
10	157 09.2	13 34.8	58.6	169 54.5	41.7	348 32.8	58.9	280 05.0	09.5	48 35.6	67	18 34.5	− 67
11	172 11.7	28 34.4	57.9	184 57.4	41.7	3 34.7	58.7	295 07.3	09.5	63 01.3	66	18 27.8	− 68
12	187 14.2	43 34.1	+13 57.2	200 00.3	−10 41.6	18 36.7	+ 5 58.5	310 09.5	−18 09.6	77 26.9	68	+18 21.0	− 69
13	202 16.6	58 33.8	56.5	215 03.2	41.6	33 38.7	58.3	325 11.8	09.6	91 52.7	67	18 14.1	− 71
14	217 19.1	73 33.5	55.8	230 06.1	41.6	48 40.7	58.1	340 14.0	09.7	106 18.4	68	18 07.0	− 72
15	232 21.6	88 33.2	·· 55.1	245 09.0	·· 41.5	63 42.6	·· 57.9	355 16.3	·· 09.7	120 44.2	68	·17 59.8	− 73
16	247 24.0	103 32.9	54.4	260 11.9	41.5	78 44.6	57.7	10 18.5	09.8	135 10.0	68	17 52.5	− 74
17	262 26.5	118 32.6	53.7	275 14.8	41.5	93 46.6	57.4	25 20.8	09.8	149 35.8	69	17 45.1	− 75
18	277 28.9	133 32.3	+13 53.0	290 17.7	−10 41.4	108 48.6	+ 5 57.2	40 23.0	−18 09.9	164 01.7	69	+17 37.6	− 77
19	292 31.4	148 32.0	52.3	305 20.6	41.4	123 50.5	57.0	55 25.2	10.0	178 27.6	70	17 29.9	− 78
20	307 33.9	163 31.7	51.6	320 23.5	41.4	138 52.5	56.8	70 27.5	10.0	192 53.6	69	17 22.1	− 79
21	322 36.3	178 31.4	·· 50.9	335 26.4	·· 41.3	153 54.5	·· 56.6	85 29.7	·· 10.1	207 19.5	70	·17 14.2	− 80
22	337 38.8	193 31.1	50.1	350 29.3	41.3	168 56.5	56.4	100 32.0	10.1	221 45.5	71	17 06.2	− 81
23	352 41.3	208 30.8	49.4	5 32.2	41.3	183 58.4	56.2	115 34.2	10.2	236 11.6	71	16 58.1	− 82
29 0	7 43.7	223 30.4	+13 48.7	20 35.1	−10 41.2	199 00.4	+ 5 56.0	130 36.5	−18 10.2	250 37.7	71	+16 49.9	− 83
1	22 46.2	238 30.1	48.0	35 37.9	41.2	214 02.4	55.8	145 38.7	10.3	265 03.8	71	16 41.6	− 85
2	37 48.7	253 29.8	47.3	50 40.8	41.2	229 04.4	55.6	160 41.0	10.3	279 29.9	72	16 33.1	− 85
3	52 51.1	268 29.5	·· 46.6	65 43.7	·· 41.1	244 06.3	·· 55.4	175 43.2	·· 10.4	293 56.1	72	·16 24.6	− 87
4	67 53.6	283 29.2	45.9	80 46.6	41.1	259 08.3	55.2	190 45.4	10.4	308 22.3	73	16 15.9	− 87
5	82 56.0	298 28.9	45.1	95 49.5	41.1	274 10.3	55.0	205 47.7	10.5	322 48.6	73	16 07.2	− 89
6	97 58.5	313 28.6	+13 44.4	110 52.4	−10 41.0	289 12.3	+ 5 54.8	220 49.9	−18 10.5	337 14.9	73	+15 58.3	− 90
7	113 01.0	328 28.3	43.7	125 55.3	41.0	304 14.2	54.6	235 52.2	10.6	351 41.2	74	15 49.3	− 91
8	128 03.4	343 28.0	43.0	140 58.1	40.9	319 16.2	54.4	250 54.4	10.7	6 07.6	74	15 40.2	− 91
9	143 05.9	358 27.7	·· 42.3	156 01.0	·· 40.9	334 18.2	·· 54.2	265 56.7	·· 10.7	20 34.0	75	·15 31.1	− 93
10	158 08.4	13 27.4	41.5	171 03.9	40.9	349 20.2	54.0	280 58.9	10.8	35 00.5	74	15 21.8	− 94
11	173 10.8	28 27.1	40.8	186 06.8	40.8	4 22.1	53.8	296 01.2	10.8	49 26.9	76	15 12.4	− 95
12	188 13.3	43 26.7	+13 40.1	201 09.6	−10 40.8	19 24.1	+ 5 53.6	311 03.4	−18 10.9	63 53.5	75	+15 02.9	− 95
13	203 15.8	58 26.4	39.4	216 12.5	40.7	34 26.1	53.4	326 05.6	10.9	78 20.0	76	14 53.4	− 97
14	218 18.2	73 26.1	38.6	231 15.4	40.7	49 28.1	53.2	341 07.9	11.0	92 46.6	77	14 43.7	− 98
15	233 20.7	88 25.8	·· 37.9	246 18.3	·· 40.6	64 30.0	·· 53.0	356 10.1	·· 11.0	107 13.3	77	·14 33.9	− 99
16	248 23.2	103 25.5	37.2	261 21.1	40.6	79 32.0	52.8	11 12.4	11.1	121 40.0	77	14 24.0	− 99
17	263 25.6	118 25.2	36.5	276 24.0	40.6	94 34.0	52.6	26 14.6	11.1	136 06.7	77	14 14.1	−101
18	278 28.1	133 24.9	+13 35.7	291 26.9	−10 40.5	109 36.0	+ 5 52.4	41 16.9	−18 11.2	150 33.4	78	+14 04.0	−101
19	293 30.5	148 24.6	35.0	306 29.7	40.5	124 37.9	52.2	56 19.1	11.2	165 00.2	79	13 53.9	−102
20	308 33.0	163 24.3	34.3	321 32.6	40.4	139 39.9	52.0	71 21.3	11.3	179 27.1	79	13 43.7	−103
21	323 35.5	178 24.0	·· 33.6	336 35.5	·· 40.4	154 41.9	·· 51.8	86 23.6	·· 11.4	193 54.0	79	·13 33.4	−105
22	338 37.9	193 23.7	32.8	351 38.3	40.3	169 43.9	51.6	101 25.8	11.4	208 20.9	79	13 22.9	−104
23	353 40.4	208 23.3	32.1	6 41.2	40.3	184 45.8	51.4	116 28.1	11.5	222 47.8	80	13 12.5	−106
24	8 42.9	223 23.0	+13 31.4	21 44.0	−10 40.2	199 47.8	+ 5 51.2	131 30.3	−18 11.5	237 14.8	81	+13 01.9	−107
code	−	− 3	− 7	+ 29	0	+ 20	− 2	+ 23	0				

G M T	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
27 0	182 13.3	− 1 32.0	7	Acamar	315 50.2	−40 28.4
1	197 13.5	32.9	5	Achernar	335 57.8	−57 27.1
2	212 13.7	33.9	30	Acrux	173 57.6	−62 51.6
3	227 13.9	·· 34.9	19	Adhara	255 46.0	−28 54.5
4	242 14.1	35.9	10	Aldebaran	291 38.1	+16 25.5
5	257 14.4	36.8				
6	272 14.6	− 1 37.8	32	Alioth	166 58.5	+56 11.7
7	287 14.8	38.8	34	Alkaid	153 32.8	+49 31.8
8	302 15.0	39.8	55	Al Na'ir	28 36.7	−47 10.2
9	317 15.2	·· 40.7	15	Alnilam	276 29.5	− 1 13.6
10	332 15.4	41.7	25	Alphard	218 38.1	− 8 28.2
11	347 15.6	42.7				
12	2 15.8	− 1 43.7	41	Alphecca	126 47.3	+26 51.8
13	17 16.0	44.6	1	Alpheratz	358 27.2	+28 51.3
14	32 16.3	45.6	51	Altair	62 49.6	+ 8 45.4
15	47 16.5	·· 46.6	2	Ankaa	353 57.2	−42 32.2
16	62 16.7	47.6	42	Antares	113 18.6	−26 20.2
17	77 16.9	48.5				
18	92 17.1	− 1 49.5	37	Arcturus	146 34.8	+19 24.5
19	107 17.3	50.5	43	Atria	108 58.9	−68 57.3
20	122 17.5	51.5	22	Avior	234 35.7	−59 22.0
21	137 17.7	·· 52.4	13	Bellatrix	279 17.5	+ 6 18.8
22	152 17.9	53.4	16	Betelg'se	271 47.3	+ 7 24.1
23	167 18.1	54.4				
			17	Canopus	264 15.0	−52 40.0
28 0	182 18.3	− 1 55.3	12	Capella	281 37.2	+45 57.2
1	197 18.6	56.3	53	Deneb	50 00.2	+45 07.9
2	212 18.8	57.3	28	Denebola	183 17.3	+14 48.9
3	227 19.0	·· 58.3	4	Diphda	349 38.2	−18 13.2
4	242 19.2	1 59.2				
5	257 19.4	2 00.2	27	Dubhe	194 44.4	+61 59.0
6	272 19.6	− 2 01.2	14	Elnath	279 06.3	+28 34.3
7	287 19.8	02.2	47	Eltanin	91 06.0	+51 30.0
8	302 20.0	03.1	54	Enif	34 28.6	+ 9 40.8
9	317 20.2	·· 04.1	56	Fomalhaut	16 10.5	−29 50.9
10	332 20.4	05.1				
11	347 20.6	06.1	31	Gacrux	172 48.9	−56 52.3
12	2 20.9	− 2 07.0	29	Gienah	176 36.4	−17 18.1
13	17 21.1	08.0	35	Hadar	149 48.9	−60 10.0
14	32 21.3	09.0	6	Hamal	328 48.5	+23 15.7
15	47 21.5	·· 10.0	48	Kaus Aust.	84 40.2	−34 24.4
16	62 21.7	10.9				
17	77 21.9	11.9	40	Kochab	137 19.0	+74 20.1
18	92 22.1	− 2 12.9	57	Markab	14 20.4	+14 58.6
19	107 22.3	13.8	8	Menkar	314 59.3	+ 3 55.4
20	122 22.5	14.8	36	Menkent	148 58.1	−36 09.5
21	137 22.7	·· 15.8	24	Miapl'dus	221 49.4	−69 32.2
22	152 22.9	16.8				
23	167 23.1	17.7	9	Mirfak	309 40.9	+49 42.5
			50	Nunki	76 50.9	−26 21.1
29 0	182 23.3	− 2 18.7	52	Peacock	54 25.9	−56 52.6
1	197 23.5	19.7	21	Pollux	244 19.8	+28 07.8
2	212 23.8	20.7	20	Procyon	245 44.3	+ 5 20.2
3	227 24.0	·· 21.6				
4	242 24.2	22.6	46	R'alhague	96 46.0	+12 35.7
5	257 24.4	23.6	26	Regulus	208 29.0	+12 10.7
6	272 24.6	− 2 24.5	11	Rigel	281 52.8	− 8 14.9
7	287 24.8	25.5	38	Rigil Kent.	140 50.5	−60 39.6
8	302 25.0	26.5	44	Sabik	103 01.4	−15 40.3
9	317 25.2	·· 27.5				
10	332 25.4	28.4	3	Schedar	350 28.5	+56 18.2
11	347 25.6	29.4	45	Shaula	97 19.8	−37 04.5
12	2 25.8	− 2 30.4	18	Sirius	259 11.2	−16 39.2
13	17 26.0	31.4	33	Spica	159 16.4	−10 56.1
14	32 26.2	32.3	23	Suhail	223 24.0	−43 15.3
15	47 26.4	·· 33.3				
16	62 26.6	34.3	49	Vega	81 07.7	+38 44.9
17	77 26.8	35.2	39	Zub'g'bi	137 52.8	−15 51.7
18	92 27.0	− 2 36.2				
19	107 27.2	37.2				
20	122 27.5	38.2				
21	137 27.7	·· 39.1				
22	152 27.9	40.1				
23	167 28.1	41.1				
24	182 28.3	− 2 42.1				
code	—	− 10				

Lat. N °	Sunrise h m	Twlt. begins h m
72	6 05	1 33
70	6 03	2 11
68	6 02	2 38
66	6 01	2 56
64	6 00	3 11
62	5 59	3 23
60	5 58	3 33
58	5 58	3 41
56	5 57	3 49
54	5 56	3 55
52	5 56	4 00
50	5 55	4 05
45	5 54	4 15
40	5 53	4 22
35	5 52	4 28
30	5 52	4 32
20	5 50	4 37
10	5 49	4 39
0	5 47	4 39
10	5 46	4 36
20	5 44	4 32
30	5 42	4 23
35	5 41	4 17
40	5 40	4 09
45	5 38	4 00
50	5 36	3 47
52	5 35	3 40
54	5 34	3 33
56	5 33	3 24
58	5 31	3 14
60	5 30	3 02
S		

Moonrise	27	28	29	30
	h m	h m	h m	h m
72	▭	20 21	23 08	25 24
70	18 36	21 22	23 33	25 36
68	20 02	21 57	23 53	25 46
66	20 41	22 22	24 08	0 08
64	21 08	22 41	24 21	0 21
62	21 28	22 57	24 31	0 31
60	21 45	23 10	24 40	0 40
58	21 59	23 21	24 48	0 48
56	22 11	23 31	24 55	0 55
54	22 22	23 39	25 01	1 01
52	22 31	23 47	25 07	1 07
50	22 40	23 54	25 12	1 12
45	22 57	24 09	0 09	1 22
40	23 12	24 21	0 21	1 31
35	23 24	24 31	0 31	1 39
30	23 35	24 40	0 40	1 46
20	23 53	24 55	0 55	1 57
10	24 09	0 09	1 09	2 07
0	24 24	0 24	1 21	2 17
10	24 39	0 39	1 34	2 26
20	0 00	0 55	1 47	2 36
30	0 20	1 13	2 02	2 47
35	0 32	1 24	2 11	2 54
40	0 45	1 36	2 21	3 01
45	1 01	1 50	2 33	3 10
50	1 20	2 08	2 47	3 20
52	1 30	2 16	2 54	3 25
54	1 40	2 25	3 01	3 30
56	1 52	2 35	3 09	3 36
58	2 05	2 47	3 19	3 43
60	2 21	3 01	3 29	3 50

Lat. N °	Sunset h m	Twlt. ends h m
72	17 34	21 56
70	17 36	21 21
68	17 37	20 57
66	17 39	20 39
64	17 40	20 25
62	17 41	20 14
60	17 42	20 04
58	17 43	19 56
56	17 43	19 49
54	17 44	19 43
52	17 44	19 37
50	17 45	19 33
45	17 46	19 24
40	17 47	19 17
35	17 48	19 12
30	17 49	19 08
20	17 51	19 04
10	17 52	19 02
0	17 54	19 03
10	17 56	19 06
20	17 57	19 11
30	18 00	19 20
35	18 01	19 26
40	18 02	19 34
45	18 04	19 44
50	18 07	19 59
52	18 07	20 04
54	18 09	20 13
56	18 10	20 22
58	18 11	20 32
60	18 13	20 45

Moonset	27	28	29	30
	h m	h m	h m	h m
72	▭	18 06	17 17	16 55
70	17 50	17 04	16 50	16 40
68	16 23	16 29	16 29	16 28
66	15 44	16 03	16 12	16 18
64	15 17	15 43	15 59	16 09
62	14 56	15 26	15 47	16 02
60	14 39	15 13	15 37	15 56
58	14 24	15 01	15 29	15 50
56	14 12	14 51	15 21	15 45
54	14 01	14 42	15 14	15 41
52	13 52	14 33	15 08	15 37
50	13 43	14 26	15 02	15 33
45	13 24	14 10	14 50	15 25
40	13 09	13 58	14 40	15 18
35	12 57	13 47	14 31	15 12
30	12 46	13 37	14 24	15 07
20	12 26	13 20	14 11	14 58
10	12 10	13 05	13 59	14 50
0	11 54	12 52	13 48	14 42
10	11 38	12 38	13 37	14 35
20	11 21	12 23	13 25	14 27
30	11 02	12 06	13 11	14 17
35	10 51	11 56	13 03	14 12
40	10 37	11 44	12 54	14 05
45	10 22	11 30	12 43	13 58
50	10 03	11 14	12 30	13 49
52	9 54	11 06	12 24	13 45
54	9 43	10 57	12 17	13 41
56	9 32	10 47	12 10	13 36
58	9 19	10 36	12 01	13 30
60	9 03	10 23	11 51	13 24

G M T	Equation of Time (App. − Mean) 27	28	29
h	m s	m s	m s
0	+ 8 52.8	+ 9 13.0	+ 9 33.0
6	+ 8 57.8	+ 9 18.0	+ 9 37.9
12	+ 9 02.9	+ 9 23.0	+ 9 42.8
18	+ 9 07.9	+ 9 28.0	+ 9 47.8
24	+ 9 13.0	+ 9 33.0	+ 9 52.7

GMT of Transit Meridian of Greenwich	DAY	Moon	Venus	Mars	Jupiter	Saturn
		h m	h m	h m	h m	h m
	27	5 40	9 05	22 43	10 49	15 22
	28	6 38	9 06	22 38	10 46	15 19
	29	7 35	9 06	22 33	10 43	15 15
	30	8 30	9 07	22 29	10 39	15 12

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.3	0.2	0.3
30	0.3	0.1	0.3
45	0.3	0.1	0.2
60	0.3	0.1	0.1
75	0.3	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	27	28	29
°	′	′	′
0	18.1	18.6	19.0
4	18.1	18.6	19.0
8	18.1	18.6	18.9
12	18.0	18.5	18.9
16	18.0	18.5	18.9
20	18.0	18.4	18.8
24	17.9	18.4	18.7
28	17.8	18.3	18.6
32	17.8	18.2	18.5
36	17.7	18.1	18.4
40	17.6	18.0	18.3
44	17.5	17.9	18.2
48	17.4	17.7	18.0
52	17.3	17.6	17.9
56	17.2	17.5	17.7
60	17.0	17.3	17.6
64	16.9	17.2	17.4
68	16.8	17.0	17.2
72	16.6	16.9	17.0
76	16.5	16.7	16.8
80	16.4	16.5	16.7
84	16.2	16.4	16.5
88	16.1	16.2	16.3
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	27	28	29
°	′	′	′
0	14.1	13.8	13.6
4	14.1	13.8	13.6
8	14.1	13.8	13.6
12	14.2	13.9	13.7
16	14.2	13.9	13.7
20	14.2	14.0	13.8
24	14.3	14.0	13.9
28	14.4	14.1	13.9
32	14.4	14.2	14.0
36	14.5	14.3	14.2
40	14.6	14.4	14.3
44	14.7	14.5	14.4
48	14.8	14.7	14.5
52	14.9	14.8	14.7
56	15.0	14.9	14.9
60	15.2	15.1	15.0
64	15.3	15.2	15.2
68	15.4	15.4	15.4
72	15.5	15.5	15.5
76	15.7	15.7	15.7
80	15.8	15.9	15.9
84	16.0	16.0	16.1
88	16.1	16.2	16.2
90			

Subtract from table, back cover

Last Quarter 27

G M T	♈	VENUS −3.7		MARS −2.2		JUPITER −1.2		SATURN 0.8		MOON			
	GHA	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
30 0	8 42.9	223 23.0	+13 31.4	21 44.0	−10 40.2	199 47.8	+ 5 51.2	131 30.3	−18 11.5	237 14.8	81	+13 01.9	−107
1	23 45.3	238 22.7	30.6	36 46.9	40.2	214 49.8	51.0	146 32.6	11.6	251 41.9	81	12 51.2	−107
2	38 47.8	253 22.4	29.9	51 49.8	40.1	229 51.8	50.8	161 34.8	11.6	266 09.0	81	12 40.5	−108
3	53 50.3	268 22.1	29.2	66 52.6	40.1	244 53.7	50.6	176 37.0	11.7	280 36.1	81	12 29.7	−109
4	68 52.7	283 21.8	28.4	81 55.5	40.0	259 55.7	50.4	191 39.3	11.7	295 03.2	82	12 18.8	−110
5	83 55.2	298 21.5	27.7	96 58.3	40.0	274 57.7	50.2	206 41.5	11.8	309 30.4	82	12 07.8	−111
6	98 57.6	313 21.2	+13 27.0	112 01.2	−10 39.9	289 59.7	+ 5 50.0	221 43.8	−18 11.8	323 57.6	83	+11 56.7	−111
7	114 00.1	328 20.9	26.2	127 04.0	39.9	305 01.6	49.8	236 46.0	11.9	338 24.9	83	11 45.6	−112
8	129 02.6	343 20.6	25.5	142 06.9	39.8	320 03.6	49.6	251 48.3	12.0	352 52.2	84	11 34.4	−113
9	144 05.0	358 20.3	24.7	157 09.7	39.8	335 05.6	49.4	266 50.5	12.0	7 19.6	84	11 23.1	−114
10	159 07.5	13 19.9	24.0	172 12.6	39.7	350 07.6	49.2	281 52.7	12.1	21 47.0	84	11 11.7	−114
11	174 10.0	28 19.6	23.3	187 15.4	39.7	5 09.6	49.0	296 55.0	12.1	36 14.4	84	11 00.3	−115
12	189 12.4	43 19.3	+13 22.5	202 18.3	−10 39.6	20 11.5	+ 5 48.8	311 57.2	−18 12.2	50 41.8	85	+10 48.8	−115
13	204 14.9	58 19.0	21.8	217 21.1	39.5	35 13.5	48.6	326 59.5	12.2	65 09.3	86	10 37.3	−117
14	219 17.4	73 18.7	21.0	232 24.0	39.5	50 15.5	48.4	342 01.7	12.3	79 36.9	85	10 25.6	−117
15	234 19.8	88 18.4	20.3	247 26.8	39.4	65 17.5	48.2	357 03.9	12.3	94 04.4	86	10 13.9	−117
16	249 22.3	103 18.1	19.6	262 29.7	39.4	80 19.4	48.0	12 06.2	12.4	108 32.0	87	10 02.2	−118
17	264 24.8	118 17.8	18.8	277 32.5	39.3	95 21.4	47.7	27 08.4	12.4	122 59.7	87	9 50.4	−119
18	279 27.2	133 17.5	+13 18.1	292 35.4	−10 39.2	110 23.4	+ 5 47.5	42 10.7	−18 12.5	137 27.4	87	+ 9 38.5	−120
19	294 29.7	148 17.2	17.3	307 38.2	39.2	125 25.4	47.3	57 12.9	12.5	151 55.1	87	9 26.5	−120
20	309 32.1	163 16.8	16.6	322 41.0	39.1	140 27.3	47.1	72 15.1	12.6	166 22.8	88	9 14.5	−120
21	324 34.6	178 16.5	15.8	337 43.9	39.1	155 29.3	46.9	87 17.4	12.7	180 50.6	88	9 02.5	−121
22	339 37.1	193 16.2	15.1	352 46.7	39.0	170 31.3	46.7	102 19.6	12.7	195 18.4	89	8 50.4	−122
23	354 39.5	208 15.9	14.3	7 49.5	38.9	185 33.3	46.5	117 21.9	12.8	209 46.3	89	8 38.2	−122
1 0	9 42.0	223 15.6	+13 13.6	22 52.4	−10 38.9	200 35.3	+ 5 46.3	132 24.1	−18 12.8	224 14.2	89	+ 8 26.0	−123
1	24 44.5	238 15.3	12.8	37 55.2	38.8	215 37.2	46.1	147 26.3	12.9	238 42.1	89	8 13.7	−123
2	39 46.9	253 15.0	12.1	52 58.0	38.8	230 39.2	45.9	162 28.6	12.9	253 10.0	90	8 01.4	−124
3	54 49.4	268 14.7	11.3	68 00.9	38.7	245 41.2	45.7	177 30.8	13.0	267 38.0	90	7 49.0	−124
4	69 51.9	283 14.4	10.6	83 03.7	38.6	260 43.2	45.5	192 33.1	13.0	282 06.0	91	7 36.6	−124
5	84 54.3	298 14.1	09.8	98 06.5	38.6	275 45.1	45.3	207 35.3	13.1	296 34.1	90	7 24.2	−125
6	99 56.8	313 13.7	+13 09.1	113 09.4	−10 38.5	290 47.1	+ 5 45.1	222 37.5	−18 13.2	311 02.1	91	+ 7 11.7	−126
7	114 59.3	328 13.4	08.3	128 12.2	38.4	305 49.1	44.9	237 39.8	13.2	325 30.2	92	6 59.1	−126
8	130 01.7	343 13.1	07.6	143 15.0	38.4	320 51.1	44.7	252 42.0	13.3	339 58.4	91	6 46.5	−126
9	145 04.2	358 12.8	06.8	158 17.8	38.3	335 53.0	44.5	267 44.3	13.3	354 26.5	92	6 33.9	−127
10	160 06.6	13 12.5	06.1	173 20.6	38.2	350 55.0	44.3	282 46.5	13.4	8 54.7	93	6 21.2	−127
11	175 09.1	28 12.2	05.3	188 23.5	38.2	5 57.0	44.1	297 48.7	13.4	23 23.0	92	6 08.5	−127
12	190 11.6	43 11.9	+13 04.5	203 26.3	−10 38.1	20 59.0	+ 5 43.9	312 51.0	−18 13.5	37 51.2	93	+ 5 55.8	−128
13	205 14.0	58 11.6	03.8	218 29.1	38.0	36 01.0	43.7	327 53.2	13.5	52 19.5	93	5 43.0	−128
14	220 16.5	73 11.3	03.0	233 31.9	38.0	51 02.9	43.5	342 55.4	13.6	66 47.8	93	5 30.2	−128
15	235 19.0	88 10.9	02.3	248 34.7	37.9	66 04.9	43.3	357 57.7	13.6	81 16.1	94	5 17.4	−129
16	250 21.4	103 10.6	01.5	263 37.6	37.8	81 06.9	43.1	12 59.9	13.7	95 44.5	94	5 04.5	−129
17	265 23.9	118 10.3	00.7	278 40.4	37.7	96 08.9	42.9	28 02.2	13.8	110 12.9	94	4 51.6	−129
18	280 26.4	133 10.0	+13 00.0	293 43.2	−10 37.7	111 10.8	+ 5 42.7	43 04.4	−18 13.8	124 41.3	94	+ 4 38.7	−130
19	295 28.8	148 09.7	12 59.2	308 46.0	37.6	126 12.8	42.5	58 06.6	13.9	139 09.7	95	4 25.7	−129
20	310 31.3	163 09.4	58.5	323 48.8	37.5	141 14.8	42.3	73 08.9	13.9	153 38.2	95	4 12.8	−130
21	325 33.7	178 09.1	57.7	338 51.6	37.4	156 16.8	42.1	88 11.1	14.0	168 06.7	95	3 59.8	−131
22	340 36.2	193 08.8	56.9	353 54.4	37.4	171 18.8	41.9	103 13.3	14.0	182 35.2	95	3 46.7	−130
23	355 38.7	208 08.5	56.2	8 57.2	37.3	186 20.7	41.7	118 15.6	14.1	197 03.7	95	3 33.7	−130
2 0	10 41.1	223 08.2	+12 55.4	24 00.0	−10 37.2	201 22.7	+ 5 41.5	133 17.8	−18 14.1	211 32.2	96	+ 3 20.7	−131
1	25 43.6	238 07.8	54.6	39 02.8	37.1	216 24.7	41.3	148 20.1	14.2	226 00.8	96	3 07.6	−131
2	40 46.1	253 07.5	53.9	54 05.6	37.1	231 26.7	41.1	163 22.3	14.2	240 29.4	96	2 54.5	−131
3	55 48.5	268 07.2	53.1	69 08.4	37.0	246 28.7	40.9	178 24.5	14.3	254 58.0	96	2 41.4	−131
4	70 51.0	283 06.9	52.3	84 11.2	36.9	261 30.6	40.7	193 26.8	14.4	269 26.6	97	2 28.3	−131
5	85 53.5	298 06.6	51.5	99 14.0	36.8	276 32.6	40.5	208 29.0	14.4	283 55.3	96	2 15.2	−132
6	100 55.9	313 06.3	+12 50.8	114 16.8	−10 36.7	291 34.6	+ 5 40.3	223 31.2	−18 14.5	298 23.9	97	+ 2 02.0	−131
7	115 58.4	328 06.0	50.0	129 19.6	36.7	306 36.6	40.1	238 33.5	14.5	312 52.6	97	1 48.9	−132
8	131 00.9	343 05.7	49.2	144 22.4	36.6	321 38.5	39.9	253 35.7	14.6	327 21.3	97	1 35.7	−131
9	146 03.3	358 05.4	48.5	159 25.2	36.5	336 40.5	39.7	268 37.9	14.6	341 50.0	97	1 22.6	−132
10	161 05.8	13 05.0	47.7	174 28.0	36.4	351 42.5	39.5	283 40.2	14.7	356 18.7	98	1 09.4	−131
11	176 08.2	28 04.7	46.9	189 30.8	36.3	6 44.5	39.3	298 42.4	14.7	10 47.5	97	0 56.3	−132
12	191 10.7	43 04.4	+12 46.1	204 33.6	−10 36.3	21 46.5	+ 5 39.1	313 44.6	−18 14.8	25 16.2	98	+ 0 43.1	−132
13	206 13.2	58 04.1	45.4	219 36.4	36.2	36 48.4	38.9	328 46.9	14.9	39 45.0	98	0 29.9	−131
14	221 15.6	73 03.8	44.6	234 39.2	36.1	51 50.4	38.7	343 49.1	14.9	54 13.8	98	0 16.8	−132
15	236 18.1	88 03.5	43.8	249 42.0	36.0	66 52.4	38.5	358 51.4	15.0	68 42.6	98	+ 0 03.6	−131
16	251 20.6	103 03.2	43.0	264 44.7	35.9	81 54.4	38.3	13 53.6	15.0	83 11.4	98	− 0 09.5	−132
17	266 23.0	118 02.9	42.3	279 47.5	35.8	96 56.4	38.1	28 55.8	15.1	97 40.2	99	0 22.7	−131
18	281 25.5	133 02.6	+12 41.5	294 50.3	−10 35.8	111 58.3	+ 5 37.9	43 58.1	−18 15.1	112 09.1	98	− 0 35.8	−132
19	296 28.0	148 02.2	40.7	309 53.1	35.7	127 00.3	37.7	59 00.3	15.2	126 37.9	99	0 49.0	−131
20	311 30.4	163 01.9	39.9	324 55.9	35.6	142 02.3	37.5	74 02.5	15.2	141 06.8	98	1 02.1	−131
21	326 32.9	178 01.6	39.1	339 58.7	35.5	157 04.3	37.3	89 04.8	15.3	155 35.6	99	1 15.2	−131
22	341 35.3	193 01.3	38.4	355 01.4	35.4	172 06.3	37.1	104 07.0	15.4	170 04.5	99	1 28.3	−130
23	356 37.8	208 01.0	37.6	10 04.2	35.3	187 08.2	36.9	119 09.2	15.4	184 33.4	99	1 41.3	−131
24	11 40.3	223 00.7	+12 36.8	25 07.0	−10 35.2	202 10.2	+ 5 36.7	134 11.5	−18 15.5	199 02.3	99	− 1 54.4	−131
code	−	− 3	− 7	+ 28	+ 1	+ 20	− 2	+ 22	0				

GMT h	SUN GHA ° ′	SUN Dec. ° ′
30 0	182 28.3	− 2 42.1
1	197 28.5	43.0
2	212 28.7	44.0
3	227 28.9	45.0
4	242 29.1	45.9
5	257 29.3	46.9
6	272 29.5	− 2 47.9
7	287 29.7	48.9
8	302 29.9	49.8
9	317 30.1	50.8
10	332 30.3	51.8
11	347 30.5	52.7
12	2 30.7	− 2 53.7
13	17 30.9	54.7
14	32 31.1	55.7
15	47 31.3	56.6
16	62 31.5	57.6
17	77 31.7	58.6
18	92 31.9	− 2 59.5
19	107 32.1	3 00.5
20	122 32.3	01.5
21	137 32.5	02.5
22	152 32.7	03.4
23	167 32.9	04.4
10 0	182 33.1	− 3 05.4
1	197 33.3	06.3
2	212 33.5	07.3
3	227 33.7	08.3
4	242 33.9	09.3
5	257 34.1	10.2
6	272 34.3	− 3 11.2
7	287 34.5	12.2
8	302 34.7	13.1
9	317 34.9	14.1
10	332 35.1	15.1
11	347 35.3	16.1
12	2 35.5	− 3 17.0
13	17 35.7	18.0
14	32 35.9	19.0
15	47 36.1	19.9
16	62 36.3	20.9
17	77 36.5	21.9
18	92 36.7	− 3 22.8
19	107 36.9	23.8
20	122 37.1	24.8
21	137 37.3	25.8
22	152 37.5	26.7
23	167 37.7	27.7
20 0	182 37.9	− 3 28.7
1	197 38.1	29.6
2	212 38.3	30.6
3	227 38.5	31.6
4	242 38.7	32.5
5	257 38.9	33.5
6	272 39.1	− 3 34.5
7	287 39.3	35.4
8	302 39.5	36.4
9	317 39.7	37.4
10	332 39.9	38.4
11	347 40.1	39.3
12	2 40.3	− 3 40.3
13	17 40.5	41.3
14	32 40.7	42.2
15	47 40.9	43.2
16	62 41.1	44.2
17	77 41.3	45.1
18	92 41.4	− 3 46.1
19	107 41.6	47.1
20	122 41.8	48.0
21	137 42.0	49.0
22	152 42.2	50.0
23	167 42.4	50.9
24	182 42.6	− 3 51.9
code	—	− 10

No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 50.2	−40 28.4
5	Achernar	335 57.8	−57 27.1
30	Acrux	173 57.6	−62 51.6
19	Adhara	255 46.0	−28 54.5
10	Aldebaran	291 38.0	+16 25.5
32	Alioth	166 58.5	+56 11.7
34	Alkaid	153 32.8	+49 31.8
55	Al Na'ir	28 36.7	−47 10.2
15	Alnilam	276 29.4	− 1 13.6
25	Alphard	218 38.1	− 8 28.2
41	Alphecca	126 47.3	+26 51.8
1	Alpheratz	358 27.2	+28 51.3
51	Altair	62 49.6	+ 8 45.5
2	Ankaa	353 57.2	−42 32.3
42	Antares	113 18.6	−26 20.2
37	Arcturus	146 34.8	+19 24.5
43	Atria	108 58.9	−68 57.3
22	Avior	234 35.7	−59 22.0
13	Bellatrix	279 17.5	+ 6 18.8
16	Betelg'se	271 47.3	+ 7 24.1
17	Canopus	264 15.0	−52 40.0
12	Capella	281 37.2	+45 57.2
53	Deneb	50 00.2	+45 07.9
28	Denebola	183 17.3	+14 48.8
4	Diphda	349 38.2	−18 13.2
27	Dubhe	194 44.3	+61 58.9
14	Elnath	279 06.3	+28 34.3
47	Eltanin	91 06.0	+51 30.0
54	Enif	34 28.6	+ 9 40.8
56	Fomalhaut	16 10.5	−29 51.0
31	Gacrux	172 48.9	−56 52.3
29	Gienah	176 36.4	−17 18.1
35	Hadar	149 48.9	−60 10.0
6	Hamal	328 48.5	+23 15.7
48	Kaus Aust.	84 40.2	−34 24.4
40	Kochab	137 19.0	+74 20.1
57	Markab	14 20.4	+14 58.6
8	Menkar	314 59.3	+ 3 55.4
36	Menkent	148 58.1	−36 09.5
24	Miapl'dus	221 49.4	−69 32.2
9	Mirfak	309 40.9	+49 42.5
50	Nunki	76 51.0	−26 21.1
52	Peacock	54 25.9	−56 52.6
21	Pollux	244 19.8	+28 07.8
20	Procyon	245 44.3	+ 5 20.2
46	R'alhague	96 46.0	+12 35.7
26	Regulus	208 29.0	+12 10.7
11	Rigel	281 52.8	− 8 14.9
38	Rigil Kent.	140 50.5	−60 39.6
44	Sabik	103 01.4	−15 40.3
3	Schedar	350 28.5	+56 18.2
45	Shaula	97 19.8	−37 04.5
18	Sirius	259 11.2	−16 39.2
33	Spica	159 16.4	−10 56.1
23	Suhail	223 24.0	−43 15.3
49	Vega	81 07.8	+38 44.9
39	Zub'g'bi	137 52.8	−15 51.7

GMT h	Equation of Time (App. Mean) 30 m s	1 m s	2 m s
0	+ 9 52.7	+10 12.1	+10 31.2
6	+ 9 57.6	+10 16.9	+10 36.0
12	+10 02.4	+10 21.7	+10 40.7
18	+10 07.3	+10 26.5	+10 45.4
24	+10 12.1	+10 31.2	+10 50.1

Lat. N °	Sunrise h m	Twlt. begins h m
72	6 19	2 01
70	6 16	2 31
68	6 13	2 52
66	6 11	3 09
64	6 09	3 22
62	6 07	3 33
60	6 05	3 42
58	6 04	3 49
56	6 03	3 56
54	6 02	4 01
52	6 01	4 06
50	6 00	4 10
45	5 58	4 19
40	5 56	4 25
35	5 55	4 30
30	5 53	4 34
20	5 51	4 38
10	5 49	4 39
0	5 46	4 38
10	5 44	4 35
20	5 41	4 28
30	5 38	4 20
35	5 37	4 12
40	5 35	4 04
45	5 32	3 53
50	5 29	3 39
52	5 28	3 32
54	5 26	3 24
56	5 25	3 14
58	5 23	3 04
60	5 21	2 50
S		

Lat. N °	Sunset h m	Twlt. ends h m
72	17 18	21 28
70	17 22	21 00
68	17 25	20 40
66	17 27	20 24
64	17 29	20 12
62	17 31	20 02
60	17 33	19 54
58	17 34	19 46
56	17 35	19 40
54	17 36	19 35
52	17 38	19 31
50	17 38	19 26
45	17 41	19 19
40	17 42	19 12
35	17 44	19 08
30	17 46	19 05
20	17 48	19 01
10	17 51	19 01
0	17 53	19 02
10	17 55	19 05
20	17 58	19 12
30	18 01	19 22
35	18 03	19 29
40	18 05	19 37
45	18 08	19 49
50	18 11	20 04
52	18 13	20 12
54	18 14	20 20
56	18 16	20 30
58	18 18	20 41
60	18 20	20 55

Lat. N °	Moonrise 30 h m	1 h m	2 h m	3 h m
72	25 24	1 24	3 31	5 36
70	25 36	1 36	3 35	5 32
68	25 46	1 46	3 38	5 28
66	0 08	1 55	3 40	5 24
64	0 21	2 02	3 42	5 22
62	0 31	2 08	3 44	5 19
60	0 40	2 13	3 45	5 17
58	0 48	2 17	3 47	5 16
56	0 55	2 21	3 48	5 14
54	1 01	2 25	3 49	5 13
52	1 07	2 28	3 50	5 11
50	1 12	2 31	3 51	5 10
45	1 22	2 38	3 53	5 08
40	1 31	2 43	3 54	5 05
35	1 39	2 48	3 56	5 04
30	1 46	2 52	3 57	5 02
20	1 57	2 59	3 59	4 59
10	2 07	3 05	4 01	4 57
0	2 17	3 11	4 03	4 55
10	2 26	3 16	4 05	4 53
20	2 36	3 22	4 07	4 50
30	2 47	3 29	4 09	4 48
35	2 54	3 33	4 10	4 46
40	3 01	3 38	4 12	4 45
45	3 10	3 43	4 13	4 43
50	3 20	3 49	4 15	4 41
52	3 25	3 52	4 16	4 40
54	3 30	3 55	4 17	4 39
56	3 36	3 58	4 18	4 37
58	3 43	4 02	4 20	4 36
60	3 50	4 07	4 21	4 35

Lat. N °	Moonset 30 h m	1 h m	2 h m	3 h m
72	16 55	16 38	16 23	16 08
70	16 40	16 31	16 24	16 15
68	16 28	16 26	16 24	16 22
66	16 18	16 22	16 24	16 27
64	16 09	16 18	16 25	16 32
62	16 02	16 14	16 25	16 35
60	15 56	16 11	16 25	16 39
58	15 50	16 09	16 25	16 42
56	15 45	16 06	16 25	16 45
54	15 41	16 04	16 26	16 47
52	15 37	16 02	16 26	16 49
50	15 33	16 00	16 26	16 51
45	15 25	15 56	16 26	16 56
40	15 18	15 53	16 27	17 00
35	15 12	15 50	16 27	17 03
30	15 07	15 48	16 27	17 06
20	14 58	15 43	16 27	17 11
10	14 50	15 39	16 27	17 15
0	14 42	15 36	16 28	17 19
10	14 35	15 32	16 28	17 23
20	14 27	15 28	16 28	17 28
30	14 17	15 23	16 28	17 33
35	14 12	15 20	16 28	17 35
40	14 05	15 17	16 28	17 39
45	13 58	15 13	16 28	17 42
50	13 49	15 09	16 28	17 47
52	13 45	15 07	16 29	17 49
54	13 41	15 05	16 29	17 51
56	13 36	15 02	16 29	17 54
58	13 30	15 00	16 29	17 57
60	13 24	14 56	16 29	18 00

GMT of Transit
Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
30	8 30	9 07	22 29	10 39	15 12
1	9 23	9 07	22 24	10 36	15 08
2	10 15	9 08	22 20	10 33	15 05
3	11 07	9 08	22 15	10 30	15 01

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.3	0.2	0.3
30	0.3	0.1	0.3
45	0.3	0.1	0.2
60	0.3	0.1	0.1
75	0.3	0.0	0.0
90			

Moon's Lower Limb Add

Alt. °	30 ′	1 ′	2 ′
0	19.2	19.2	19.0
4	19.2	19.2	19.0
8	19.2	19.2	18.9
12	19.2	19.2	18.9
16	19.1	19.1	18.9
20	19.0	19.0	18.8
24	18.9	18.9	18.7
28	18.9	18.9	18.6
32	18.7	18.7	18.5
36	18.6	18.6	18.4
40	18.5	18.5	18.3
44	18.4	18.4	18.2
48	18.2	18.2	18.0
52	18.0	18.0	17.9
56	17.9	17.9	17.7
60	17.7	17.7	17.6
64	17.5	17.5	17.4
68	17.3	17.3	17.2
72	17.1	17.1	17.0
76	16.9	16.9	16.8
80	16.7	16.7	16.7
84	16.5	16.5	16.5
88	16.4	16.4	16.3
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt. °	30 ′	1 ′	2 ′
0	13.4	13.4	13.6
4	13.5	13.5	13.6
8	13.5	13.5	13.6
12	13.5	13.5	13.7
16	13.6	13.6	13.7
20	13.7	13.7	13.8
24	13.7	13.7	13.9
28	13.8	13.8	13.9
32	13.9	13.9	14.0
36	14.1	14.1	14.2
40	14.2	14.2	14.3
44	14.3	14.3	14.4
48	14.5	14.5	14.5
52	14.6	14.6	14.7
56	14.8	14.8	14.9
60	15.0	15.0	15.0
64	15.2	15.2	15.2
68	15.3	15.3	15.4
72	15.5	15.5	15.5
76	15.7	15.7	15.7
80	15.9	15.9	15.9
84	16.1	16.1	16.1
88	16.3	16.3	16.2
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.7 GHA	Dec.	MARS −2.1 GHA	Dec.	JUPITER −1.3 GHA	Dec.	SATURN 0.8 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
3 00	11 40.3	223 00.7	+12 36.8	25 07.0	−10 35.2	202 10.2	+ 5 36.7	134 11.5	−18 15.5	199 02.3	99	− 1 54.4	−131
01	26 42.7	238 00.4	36.0	40 09.8	35.1	217 12.2	36.5	149 13.7	15.5	213 31.2	99	2 07.5	−130
02	41 45.2	253 00.1	35.2	55 12.5	35.0	232 14.2	36.3	164 15.9	15.6	228 00.1	99	2 20.5	−130
03	56 47.7	267 59.8	·· 34.4	70 15.3	·· 35.0	247 16.2	·· 36.1	179 18.2	·· 15.6	242 29.0	99	· 2 33.5	−130
04	71 50.1	282 59.5	33.6	85 18.1	34.9	262 18.1	35.9	194 20.4	15.7	256 57.9	99	2 46.5	−129
05	86 52.6	297 59.1	32.9	100 20.8	34.8	277 20.1	35.7	209 22.6	15.7	271 26.8	100	2 59.4	−130
06	101 55.1	312 58.8	+12 32.1	115 23.6	−10 34.7	292 22.1	+ 5 35.5	224 24.9	−18 15.8	285 55.8	99	− 3 12.4	−129
07	116 57.5	327 58.5	31.3	130 26.4	34.6	307 24.1	35.3	239 27.1	15.8	300 24.7	99	3 25.3	−129
08	132 00.0	342 58.2	30.5	145 29.2	34.5	322 26.1	35.1	254 29.3	15.9	314 53.6	100	3 38.2	−128
09	147 02.5	357 57.9	·· 29.7	160 31.9	·· 34.4	337 28.0	·· 34.9	269 31.6	·· 16.0	329 22.6	99	· 3 51.0	−128
10	162 04.9	12 57.6	28.9	175 34.7	34.3	352 30.0	34.7	284 33.8	16.0	343 51.5	100	4 03.8	−128
11	177 07.4	27 57.3	28.1	190 37.4	34.2	7 32.0	34.5	299 36.0	16.1	358 20.5	99	4 16.6	−128
12	192 09.8	42 57.0	+12 27.3	205 40.2	−10 34.1	22 34.0	+ 5 34.3	314 38.3	−18 16.1	12 49.4	100	− 4 29.4	−127
13	207 12.3	57 56.7	26.5	220 43.0	34.0	37 36.0	34.1	329 40.5	16.2	27 18.4	99	4 42.1	−127
14	222 14.8	72 56.3	25.7	235 45.7	33.9	52 37.9	33.9	344 42.7	16.2	41 47.3	100	4 54.8	−127
15	237 17.2	87 56.0	·· 25.0	250 48.5	·· 33.8	67 39.9	·· 33.7	359 45.0	·· 16.3	56 16.3	99	· 5 07.5	−126
16	252 19.7	102 55.7	24.2	265 51.2	33.7	82 41.9	33.5	14 47.2	16.3	70 45.2	99	5 20.1	−126
17	267 22.2	117 55.4	23.4	280 54.0	33.6	97 43.9	33.3	29 49.4	16.4	85 14.1	100	5 32.7	−125
18	282 24.6	132 55.1	+12 22.6	295 56.7	−10 33.5	112 45.9	+ 5 33.1	44 51.7	−18 16.5	99 43.1	99	− 5 45.2	−125
19	297 27.1	147 54.8	21.8	310 59.5	33.4	127 47.8	32.9	59 53.9	16.5	114 12.0	100	5 57.7	−125
20	312 29.6	162 54.5	21.0	326 02.2	. 33.3	142 49.8	32.7	74 56.1	16.6	128 41.0	99	6 10.2	−124
21	327 32.0	177 54.2	·· 20.2	341 05.0	·· 33.2	157 51.8	·· 32.5	89 58.4	·· 16.6	143 09.9	100	· 6 22.6	−124
22	342 34.5	192 53.9	19.4	356 07.7	33.1	172 53.8	32.3	105 00.6	16.7	157 38.9	99	6 35.0	−123
23	357 37.0	207 53.5	18.6	11 10.5	33.0	187 55.8	32.1	120 02.8	16.7	172 07.8	99	6 47.3	−122
4 00	12 39.4	222 53.2	+12 17.8	26 13.2	−10 32.9	202 57.7	+ 5 31.9	135 05.1	−18 16.8	186 36.7	100	− 6 59.5	−123
01	27 41.9	237 52.9	17.0	41 16.0	32.8	217 59.7	31.7	150 07.3	16.8	201 05.7	99	7 11.8	−121
02	42 44.3	252 52.6	16.2	56 18.7	32.7	233 01.7	31.5	165 09.5	16.9	215 34.6	99	7 23.9	−122
03	57 46.8	267 52.3	·· 15.4	71 21.5	·· 32.6	248 03.7	·· 31.3	180 11.7	·· 17.0	230 03.5	99	· 7 36.1	−120
04	72 49.3	282 52.0	14.6	86 24.2	32.5	263 05.7	31.1	195 14.0	17.0	244 32.4	99	7 48.1	−120
05	87 51.7	297 51.7	13.8	101 26.9	32.4	278 07.7	30.9	210 16.2	17.1	259 01.3	99	8 00.1	−120
06	102 54.2	312 51.4	+12 13.0	116 29.7	−10 32.3	293 09.6	+ 5 30.7	225 18.4	−18 17.1	273 30.2	99	− 8 12.1	−119
07	117 56.7	327 51.1	12.2	131 32.4	32.2	308 11.6	30.5	240 20.7	17.2	287 59.1	99	8 24.0	−118
08	132 59.1	342 50.8	11.4	146 35.2	32.1	323 13.6	30.3	255 22.9	17.2	302 28.0	99	8 35.8	−118
09	148 01.6	357 50.4	·· 10.6	161 37.9	·· 32.0	338 15.6	·· 30.1	270 25.1	·· 17.3	316 56.9	99	· 8 47.6	−117
10	163 04.1	12 50.1	09.7	176 40.6	31.8	353 17.6	29.9	285 27.4	17.3	331 25.8	99	8 59.3	−117
11	178 06.5	27 49.8	08.9	191 43.4	31.7	8 19.5	29.7	300 29.6	17.4	345 54.7	98	9 11.0	−116
12	193 09.0	42 49.5	+12 08.1	206 46.1	−10 31.6	23 21.5	+ 5 29.5	315 31.8	−18 17.5	0 23.5	99	− 9 22.6	−115
13	208 11.4	57 49.2	07.3	221 48.8	31.5	38 23.5	29.3	330 34.1	17.5	14 52.4	98	9 34.1	−115
14	223 13.9	72 48.9	06.5	236 51.5	31.4	53 25.5	29.1	345 36.3	17.6	29 21.2	99	9 45.6	−114
15	238 16.4	87 48.6	·· 05.7	251 54.3	·· 31.3	68 27.5	·· 28.9	0 38.5	·· 17.6	43 50.1	98	· 9 57.0	−114
16	253 18.8	102 48.3	04.9	266 57.0	31.2	83 29.5	28.7	15 40.7	17.7	58 18.9	98	10 08.4	−112
17	268 21.3	117 48.0	04.1	281 59.7	31.1	98 31.4	28.5	30 43.0	17.7	72 47.7	98	10 19.6	−112
18	283 23.8	132 47.6	+12 03.3	297 02.4	−10 31.0	113 33.4	+ 5 28.3	45 45.2	−18 17.8	87 16.5	98	−10 30.8	−112
19	298 26.2	147 47.3	02.5	312 05.2	30.8	128 35.4	28.1	60 47.4	17.8	101 45.3	98	10 42.0	−110
20	313 28.7	162 47.0	01.6	327 07.9	30.7	143 37.4	27.9	75 49.7	17.9	116 14.1	98	10 53.0	−110
21	328 31.2	177 46.7	·· 00.8	342 10.6	·· 30.6	158 39.4	·· 27.7	90 51.9	·· 18.0	130 42.9	98	·11 04.0	−109
22	343 33.6	192 46.4	12 00.0	357 13.3	30.5	173 41.4	27.5	105 54.1	18.0	145 11.7	98	11 14.9	−109
23	358 36.1	207 46.1	11 59.2	12 16.0	30.4	188 43.3	27.3	120 56.3	18.1	159 40.5	97	11 25.8	−108
5 00	13 38.6	222 45.8	+11 58.4	27 18.8	−10 30.3	203 45.3	+ 5 27.1	135 58.6	−18 18.1	174 09.2	98	−11 36.6	−106
01	28 41.0	237 45.5	57.6	42 21.5	30.1	218 47.3	26.9	151 00.8	18.2	188 38.0	97	11 47.2	−107
02	43 43.5	252 45.2	56.7	57 24.2	30.0	233 49.3	26.7	166 03.0	18.2	203 06.7	98	11 57.9	−105
03	58 45.9	267 44.8	·· 55.9	72 26.9	·· 29.9	248 51.3	·· 26.5	181 05.3	·· 18.3	217 35.5	97	·12 08.4	−105
04	73 48.4	282 44.5	55.1	87 29.6	29.8	263 53.2	26.3	196 07.5	18.4	232 04.2	97	12 18.9	−103
05	88 50.9	297 44.2	54.3	102 32.3	29.7	278 55.2	26.1	211 09.7	18.4	246 32.9	97	12 29.2	−103
06	103 53.3	312 43.9	+11 53.5	117 35.0	−10 29.6	293 57.2	+ 5 25.9	226 11.9	−18 18.5	261 01.6	97	−12 39.5	−102
07	118 55.8	327 43.6	52.7	132 37.7	29.4	308 59.2	25.7	241 14.2	18.5	275 30.3	97	12 49.7	−102
08	133 58.3	342 43.3	51.8	147 40.4	29.3	324 01.2	25.5	256 16.4	18.6	289 59.0	96	12 59.9	−100
09	149 00.7	357 43.0	·· 51.0	162 43.1	·· 29.2	339 03.2	·· 25.3	271 18.6	·· 18.6	304 27.6	97	·13 09.9	−100
10	164 03.2	12 42.7	50.2	177 45.8	29.1	354 05.1	25.1	286 20.9	18.7	318 56.3	97	13 19.9	− 99
11	179 05.7	27 42.4	49.4	192 48.5	28.9	9 07.1	24.9	301 23.1	18.7	333 25.0	96	13 29.8	− 97
12	194 08.1	42 42.1	+11 48.5	207 51.2	−10 28.8	24 09.1	+ 5 24.7	316 25.3	−18 18.8	347 53.6	96	−13 39.5	− 98
13	209 10.6	57 41.7	47.7	222 53.9	28.7	39 11.1	24.5	331 27.5	18.9	2 22.2	97	13 49.3	− 96
14	224 13.1	72 41.4	46.9	237 56.6	28.6	54 13.1	24.3	346 29.8	18.9	16 50.9	96	13 58.9	− 95
15	239 15.5	87 41.1	·· 46.1	252 59.3	·· 28.5	69 15.1	·· 24.1	1 32.0	·· 19.0	31 19.5	96	·14 08.4	− 94
16	254 18.0	102 40.8	45.2	268 02.0	28.3	84 17.1	23.9	16 34.2	19.0	45 48.1	96	14 17.8	− 94
17	269 20.4	117 40.5	44.4	283 04.7	28.2	99 19.0	23.7	31 36.5	19.1	60 16.7	95	14 27.2	− 92
18	284 22.9	132 40.2	+11 43.6	298 07.4	−10 28.1	114 21.0	+ 5 23.5	46 38.7	−18 19.1	74 45.2	96	−14 36.4	− 92
19	299 25.4	147 39.9	42.7	313 10.1	28.0	129 23.0	23.3	61 40.9	19.2	89 13.8	96	14 45.6	− 91
20	314 27.8	162 39.6	41.9	328 12.8	27.8	144 25.0	23.1	76 43.1	19.2	103 42.4	95	14 54.7	− 89
21	329 30.3	177 39.3	·· 41.1	343 15.5	·· 27.7	159 27.0	·· 22.9	91 45.4	·· 19.3	118 10.9	96	·15 03.6	− 89
22	344 32.8	192 38.9	40.3	358 18.2	27.6	174 29.0	22.7	106 47.6	19.4	132 39.5	95	15 12.5	− 88
23	359 35.2	207 38.6	39.4	13 20.9	27.4	189 30.9	22.5	121 49.8	19.4	147 08.0	96	15 21.3	− 87
24	14 37.7	222 38.3	+11 38.6	28 23.5	−10 27.3	204 32.9	+ 5 22.3	136 52.0	−18 19.5	161 36.6	95	−15 30.0	− 86
code	—	− 3	− 8	+ 27	+ 1	+ 20	− 2	+ 23	0				

G M T	SUN GHA	SUN Dec.
h	° ′	° ′
3 0	182 42.6	− 3 51.9
1	197 42.8	52.9
2	212 43.0	53.8
3	227 43.2	54.8
4	242 43.4	55.8
5	257 43.6	56.7
6	272 43.8	− 3 57.7
7	287 44.0	58.7
8	302 44.2	3 59.6
9	317 44.4	4 00.6
10	332 44.5	01.6
11	347 44.7	02.6
12	2 44.9	− 4 03.5
13	17 45.1	04.5
14	32 45.3	05.5
15	47 45.5	06.4
16	62 45.7	07.4
17	77 45.9	08.3
18	92 46.1	− 4 09.3
19	107 46.3	10.3
20	122 46.5	11.2
21	137 46.7	12.2
22	152 46.9	13.2
23	167 47.0	14.1
4 0	182 47.2	− 4 15.1
1	197 47.4	16.1
2	212 47.6	17.0
3	227 47.8	18.0
4	242 48.0	19.0
5	257 48.2	19.9
6	272 48.4	− 4 20.9
7	287 48.6	21.9
8	302 48.8	22.8
9	317 48.9	23.8
10	332 49.1	24.8
11	347 49.3	25.7
12	2 49.5	− 4 26.7
13	17 49.7	27.7
14	32 49.9	28.6
15	47 50.1	29.6
16	62 50.3	30.6
17	77 50.5	31.5
18	92 50.6	− 4 32.5
19	107 50.8	33.4
20	122 51.0	34.4
21	137 51.2	35.4
22	152 51.4	36.3
23	167 51.6	37.3
5 0	182 51.8	− 4 38.3
1	197 52.0	39.2
2	212 52.1	40.2
3	227 52.3	41.2
4	242 52.5	42.1
5	257 52.7	43.1
6	272 52.9	− 4 44.0
7	287 53.1	45.0
8	302 53.3	46.0
9	317 53.4	46.9
10	332 53.6	47.9
11	347 53.8	48.9
12	2 54.0	− 4 49.8
13	17 54.2	50.8
14	32 54.4	51.7
15	47 54.6	52.7
16	62 54.7	53.7
17	77 54.9	54.6
18	92 55.1	− 4 55.6
19	107 55.3	56.6
20	122 55.5	57.5
21	137 55.7	58.5
22	152 55.8	4 59.4
23	167 56.0	5 00.4
24	182 56.2	− 5 01.4
code	—	− 10

STARS No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 50.2	−40 28.4
5	Achernar	335 57.8	−57 27.2
30	Acrux	173 57.6	−62 51.6
19	Adhara	255 46.0	−28 54.5
10	Aldebaran	291 38.0	+16 25.5
32	Alioth	166 58.5	+56 11.7
34	Alkaid	153 32.8	+49 31.8
55	Al Na'ir	28 36.7	−47 10.2
15	Alnilam	276 29.4	− 1 13.6
25	Alphard	218 38.1	− 8 28.2
41	Alphecca	126 47.3	+26 51.8
1	Alpheratz	358 27.2	+28 51.3
51	Altair	62 49.6	+ 8 45.5
2	Ankaa	353 57.1	−42 32.3
42	Antares	113 18.6	−26 20.2
37	Arcturus	146 34.8	+19 24.5
43	Atria	108 58.9	−68 57.3
22	Avior	234 35.7	−59 22.0
13	Bellatrix	279 17.5	+ 6 18.8
16	Betelg'se	271 47.2	+ 7 24.1
17	Canopus	264 15.0	−52 40.0
12	Capella	281 37.1	+45 57.2
53	Deneb	50 00.3	+45 07.9
28	Denebola	183 17.3	+14 48.8
4	Diphda	349 38.2	−18 13.2
27	Dubhe	194 44.3	+61 58.9
14	Elnath	279 06.3	+28 34.3
47	Eltanin	91 06.0	+51 30.0
54	Enif	34 28.6	+ 9 40.8
56	Fomalhaut	16 10.5	−29 51.0
31	Gacrux	172 48.9	−56 52.3
29	Gienah	176 36.4	−17 18.1
35	Hadar	149 48.9	−60 10.0
6	Hamal	328 48.5	+23 15.7
48	Kaus Aust.	84 40.2	−34 24.4
40	Kochab	137 19.1	+74 20.1
57	Markab	14 20.4	+14 58.6
8	Menkar	314 59.3	+ 3 55.4
36	Menkent	148 58.1	−36 09.5
24	Miapl'dus	221 49.3	−69 32.2
9	Mirfak	309 40.9	+49 42.5
50	Nunki	76 51.0	−26 21.1
52	Peacock	54 25.9	−56 52.6
21	Pollux	244 19.8	+28 07.8
20	Procyon	245 44.3	+ 5 20.2
46	R'alhague	96 46.0	+12 35.7
26	Regulus	208 29.0	+12 10.7
11	Rigel	281 52.8	− 8 14.9
38	Rigil Kent.	140 50.5	−60 39.6
44	Sabik	103 01.5	−15 40.3
3	Schedar	350 28.5	+56 18.2
45	Shaula	97 19.8	−37 04.5
18	Sirius	259 11.2	−16 39.2
33	Spica	159 16.4	−10 56.1
23	Suhail	223 24.0	−43 15.3
49	Vega	81 07.8	+38 44.9
39	Zub'g'bi	137 52.8	−15 51.7

G M T	Equation of Time (App.—Mean) 3	4	5
h	m s	m s	m s
0	+10 50.1	+11 08.6	+11 26.7
6	+10 54.7	+11 13.1	+11 31.2
12	+10 59.3	+11 17.7	+11 35.6
18	+11 04.0	+11 22.2	+11 40.1
24	+11 08.6	+11 26.7	+11 44.5

Lat. N °	Sunrise h m	Twlt. begins h m
72	6 32	2 24
70	6 27	2 48
68	6 23	3 07
66	6 20	3 21
64	6 17	3 32
62	6 15	3 42
60	6 13	3 50
58	6 11	3 56
56	6 09	4 02
54	6 07	4 07
52	6 06	4 11
50	6 04	4 15
45	6 02	4 22
40	5 59	4 28
35	5 57	4 32
30	5 55	4 35
20	5 52	4 38
10	5 48	4 38
0	5 45	4 37
10	5 42	4 33
20	5 39	4 26
30	5 35	4 15
35	5 32	4 08
40	5 30	3 58
45	5 26	3 46
50	5 23	3 31
52	5 21	3 23
54	5 19	3 14
56	5 17	3 04
58	5 14	2 52
60	5 12	2 37

Lat. N °	Sunset h m	Twlt. ends h m
72	17 03	21 05
70	17 08	20 42
68	17 12	20 24
66	17 16	20 11
64	17 19	20 00
62	17 21	19 51
60	17 24	19 44
58	17 26	19 38
56	17 27	19 31
54	17 29	19 27
52	17 31	19 23
50	17 32	19 20
45	17 35	19 13
40	17 38	19 08
35	17 40	19 04
30	17 42	19 01
20	17 46	18 59
10	17 49	18 59
0	17 52	19 01
10	17 55	19 05
20	17 59	19 13
30	18 03	19 24
35	18 06	19 32
40	18 08	19 41
45	18 12	19 54
50	18 16	20 10
52	18 18	20 18
54	18 20	20 28
56	18 22	20 38
58	18 24	20 51
60	18 27	21 06

Lat. N °	Moonrise 3 h m	4 h m	5 h m	6 h m
72	5 36	7 42	9 54	12 34
70	5 32	7 28	9 26	11 30
68	5 28	7 17	9 06	10 55
66	5 24	7 07	8 50	10 30
64	5 22	7 00	8 37	10 10
62	5 19	6 53	8 26	9 55
60	5 17	6 48	8 16	9 42
58	5 16	6 43	8 08	9 30
56	5 14	6 39	8 01	9 20
54	5 13	6 35	7 55	9 12
52	5 11	6 31	7 49	9 04
50	5 10	6 28	7 44	8 57
45	5 08	6 21	7 33	8 42
40	5 05	6 15	7 24	8 30
35	5 04	6 10	7 16	8 20
30	5 02	6 06	7 09	8 11
20	4 59	5 59	6 57	7 56
10	4 57	5 52	6 47	7 42
0	4 55	5 46	6 38	7 30
10	4 53	5 40	6 28	7 18
20	4 50	5 34	6 18	7 04
30	4 48	5 27	6 07	6 49
35	4 46	5 23	6 00	6 41
40	4 45	5 18	5 53	6 31
45	4 43	5 13	5 45	6 19
50	4 41	5 06	5 34	6 05
52	4 40	5 03	5 30	5 59
54	4 39	5 00	5 24	5 52
56	4 37	4 57	5 19	5 44
58	4 36	4 53	5 12	5 35
60	4 35	4 49	5 05	5 25

Lat. N °	Moonset 3 h m	4 h m	5 h m	6 h m
72	16 08	15 51	15 28	14 37
70	16 15	16 07	15 57	15 42
68	16 22	16 20	16 18	16 18
66	16 27	16 31	16 36	16 44
64	16 32	16 40	16 50	17 04
62	16 35	16 47	17 02	17 21
60	16 39	16 54	17 12	17 34
58	16 42	17 00	17 21	17 46
56	16 45	17 05	17 28	17 56
54	16 47	17 10	17 35	18 05
52	16 49	17 14	17 42	18 14
50	16 51	17 18	17 47	18 21
45	16 56	17 27	18 00	18 36
40	17 00	17 34	18 10	18 49
35	17 03	17 40	18 19	19 00
30	17 06	17 45	18 26	19 10
20	17 11	17 55	18 40	19 27
10	17 15	18 03	18 52	19 41
0	17 19	18 11	19 03	19 55
10	17 23	18 19	19 14	20 09
20	17 28	18 27	19 26	20 23
30	17 33	18 36	19 39	20 40
35	17 35	18 42	19 47	20 50
40	17 39	18 48	19 56	21 01
45	17 42	18 55	20 06	21 14
50	17 47	19 04	20 19	21 30
52	17 49	19 08	20 25	21 38
54	17 51	19 13	20 32	21 46
56	17 54	19 18	20 39	21 56
58	17 57	19 23	20 47	22 06
60	18 00	19 30	20 57	22 19

GMT of Transit
Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
3	11 07	9 08	22 15	10 30	15 01
4	11 58	9 09	22 11	10 27	14 57
5	12 50	9 09	22 07	10 24	14 54
6	13 42	9 10	22 03	10 20	14 50

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.3	0.1	0.3
30	0.3	0.1	0.3
45	0.3	0.1	0.2
60	0.3	0.1	0.1
75	0.3	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	3	4	5
°	′	′	′
0	18.6	17.8	16.9
4	18.6	17.8	16.9
8	18.6	17.8	16.9
12	18.5	17.8	16.9
16	18.5	17.8	16.9
20	18.4	17.7	16.9
24	18.4	17.7	16.8
28	18.3	17.6	16.8
32	18.2	17.5	16.8
36	18.1	17.5	16.7
40	18.0	17.4	16.7
44	17.9	17.3	16.6
48	17.7	17.2	16.6
52	17.6	17.1	16.5
56	17.5	17.0	16.4
60	17.3	16.9	16.4
64	17.2	16.8	16.3
68	17.0	16.7	16.2
72	16.9	16.5	16.2
76	16.7	16.4	16.1
80	16.5	16.3	16.0
84	16.4	16.2	15.9
88	16.2	16.1	15.9
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	3	4	5
°	′	′	′
0	13.8	14.2	14.8
4	13.8	14.3	14.8
8	13.8	14.3	14.8
12	13.9	14.3	14.8
16	13.9	14.3	14.8
20	14.0	14.4	14.8
24	14.0	14.4	14.9
28	14.1	14.5	14.9
32	14.2	14.5	14.9
36	14.3	14.6	15.0
40	14.4	14.7	15.0
44	14.5	14.8	15.1
48	14.7	14.9	15.1
52	14.8	15.0	15.2
56	14.9	15.1	15.3
60	15.1	15.2	15.3
64	15.2	15.3	15.4
68	15.4	15.4	15.5
72	15.5	15.5	15.5
76	15.7	15.7	15.6
80	15.9	15.8	15.7
84	16.0	15.9	15.8
88	16.2	16.0	15.8
90			

Subtract from table, back cover

New Moon 4

GMT	♈ GHA	VENUS −3.7 GHA	VENUS −3.7 Dec.	MARS −2.0 GHA	MARS −2.0 Dec.	JUPITER −1.3 GHA	JUPITER −1.3 Dec.	SATURN 0.8 GHA	SATURN 0.8 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
6 00	14 37.7	222 38.3	+11 38.6	28 23.5	−10 27.3	204 32.9	+ 5 22.3	136 52.0	−18 19.5	161 36.6	95	−15 30.0	− 86
01	29 40.2	237 38.0	37.8	43 26.2	27.2	219 34.9	22.1	151 54.3	19.5	176 05.1	95	15 38.6	− 85
02	44 42.6	252 37.7	36.9	58 28.9	27.0	234 36.9	21.9	166 56.5	19.6	190 33.6	95	15 47.1	− 84
03	59 45.1	267 37.4	·· 36.1	73 31.6	·· 26.9	249 38.9	·· 21.7	181 58.7	·· 19.6	205 02.1	95	·15 55.5	− 83
04	74 47.5	282 37.1	35.3	88 34.3	26.8	264 40.9	21.5	197 00.9	19.7	219 30.6	95	16 03.8	− 82
05	89 50.0	297 36.8	34.4	103 36.9	26.6	279 42.8	21.3	212 03.2	19.8	233 59.1	95	16 12.0	− 81
06	104 52.5	312 36.5	+11 33.6	118 39.6	−10 26.5	294 44.8	+ 5 21.1	227 05.4	−18 19.8	248 27.6	95	−16 20.1	− 80
07	119 54.9	327 36.2	32.8	133 42.3	26.4	309 46.8	20.9	242 07.6	19.9	262 56.1	94	16 28.1	− 79
08	134 57.4	342 35.8	31.9	148 45.0	26.2	324 48.8	20.7	257 09.8	19.9	277 24.5	95	16 36.0	− 78
09	149 59.9	357 35.5	·· 31.1	163 47.6	·· 26.1	339 50.8	·· 20.5	272 12.1	·· 20.0	291 53.0	95	·16 43.8	− 77
10	165 02.3	12 35.2	30.2	178 50.3	26.0	354 52.8	20.3	287 14.3	20.0	306 21.5	94	16 51.5	− 76
11	180 04.8	27 34.9	29.4	193 53.0	25.8	9 54.8	20.1	302 16.5	20.1	320 49.9	95	16 59.1	− 74
12	195 07.3	42 34.6	+11 28.6	208 55.7	−10 25.7	24 56.7	+ 5 19.9	317 18.7	−18 20.1	335 18.4	94	−17 06.5	− 74
13	210 09.7	57 34.3	27.7	223 58.3	25.6	39 58.7	19.7	332 21.0	20.2	349 46.8	94	17 13.9	− 73
14	225 12.2	72 34.0	26.9	239 01.0	25.4	55 00.7	19.5	347 23.2	20.3	4 15.2	95	17 21.2	− 72
15	240 14.7	87 33.7	·· 26.0	254 03.7	·· 25.3	70 02.7	·· 19.3	2 25.4	·· 20.3	18 43.7	94	·17 28.4	− 71
16	255 17.1	102 33.4	25.2	269 06.3	25.2	85 04.7	19.1	17 27.6	20.4	33 12.1	94	17 35.5	− 69
17	270 19.6	117 33.1	24.4	284 09.0	25.0	100 06.7	18.9	32 29.9	20.4	47 40.5	95	17 42.4	− 69
18	285 22.0	132 32.7	+11 23.5	299 11.6	−10 24.9	115 08.7	+ 5 18.7	47 32.1	−18 20.5	62 09.0	94	−17 49.3	− 67
19	300 24.5	147 32.4	22.7	314 14.3	24.7	130 10.6	18.5	62 34.3	20.5	76 37.4	94	17 56.0	− 67
20	315 27.0	162 32.1	21.8	329 17.0	24.6	145 12.6	18.3	77 36.5	20.6	91 05.8	94	18 02.7	− 65
21	330 29.4	177 31.8	·· 21.0	344 19.6	·· 24.5	160 14.6	·· 18.1	92 38.8	·· 20.7	105 34.2	95	·18 09.2	− 64
22	345 31.9	192 31.5	20.1	359 22.3	24.3	175 16.6	17.9	107 41.0	20.7	120 02.7	94	18 15.6	− 64
23	0 34.4	207 31.2	19.3	14 24.9	24.2	190 18.6	17.8	122 43.2	20.8	134 31.1	94	18 22.0	− 62
7 00	15 36.8	222 30.9	+11 18.4	29 27.6	−10 24.0	205 20.6	+ 5 17.6	137 45.4	−18 20.8	148 59.5	94	−18 28.2	− 61
01	30 39.3	237 30.6	17.6	44 30.2	23.9	220 22.6	17.4	152 47.7	20.9	163 27.9	94	18 34.3	− 60
02	45 41.8	252 30.3	16.7	59 32.9	23.7	235 24.5	17.2	167 49.9	20.9	177 56.3	95	18 40.3	− 59
03	60 44.2	267 30.0	·· 15.9	74 35.5	·· 23.6	250 26.5	·· 17.0	182 52.1	·· 21.0	192 24.8	94	·18 46.2	− 57
04	75 46.7	282 29.6	15.0	89 38.2	23.4	265 28.5	16.8	197 54.3	21.1	206 53.2	94	18 51.9	− 57
05	90 49.2	297 29.3	14.2	104 40.8	23.3	280 30.5	16.6	212 56.6	21.1	221 21.6	94	18 57.6	− 56
06	105 51.6	312 29.0	+11 13.3	119 43.5	−10 23.2	295 32.5	+ 5 16.4	227 58.8	−18 21.2	235 50.0	95	−19 03.2	− 54
07	120 54.1	327 28.7	12.5	134 46.1	23.0	310 34.5	16.2	243 01.0	21.2	250 18.5	94	19 08.6	− 53
08	135 56.5	342 28.4	11.6	149 48.8	22.9	325 36.5	16.0	258 03.2	21.3	264 46.9	95	19 13.9	− 52
09	150 59.0	357 28.1	·· 10.8	164 51.4	·· 22.7	340 38.4	·· 15.8	273 05.4	·· 21.3	279 15.4	94	·19 19.1	− 52
10	166 01.5	12 27.8	09.9	179 54.0	22.6	355 40.4	15.6	288 07.7	21.4	293 43.8	95	19 24.3	− 50
11	181 03.9	27 27.5	09.1	194 56.7	22.4	10 42.4	15.4	303 09.9	21.4	308 12.3	94	19 29.3	− 48
12	196 06.4	42 27.2	+11 08.2	209 59.3	−10 22.3	25 44.4	+ 5 15.2	318 12.1	−18 21.5	322 40.7	95	−19 34.1	− 48
13	211 08.9	57 26.9	07.3	225 01.9	22.1	40 46.4	15.0	333 14.3	21.6	337 09.2	95	19 38.9	− 47
14	226 11.3	72 26.6	06.5	240 04.6	22.0	55 48.4	14.8	348 16.6	21.6	351 37.7	94	19 43.6	− 45
15	241 13.8	87 26.2	·· 05.6	255 07.2	·· 21.8	70 50.4	·· 14.6	3 18.8	·· 21.7	6 06.1	95	·19 48.1	− 45
16	256 16.3	102 25.9	04.8	270 09.8	21.7	85 52.4	14.4	18 21.0	21.7	20 34.6	95	19 52.6	− 43
17	271 18.7	117 25.6	03.9	285 12.5	21.5	100 54.3	14.2	33 23.2	21.8	35 03.1	95	19 56.9	− 42
18	286 21.2	132 25.3	+11 03.1	300 15.1	−10 21.4	115 56.3	+ 5 14.0	48 25.5	−18 21.8	49 31.6	96	−20 01.1	− 41
19	301 23.6	147 25.0	02.2	315 17.7	21.2	130 58.3	13.8	63 27.7	21.9	64 00.2	95	20 05.2	− 40
20	316 26.1	162 24.7	01.3	330 20.4	21.1	146 00.3	13.6	78 29.9	22.0	78 28.7	95	20 09.2	− 38
21	331 28.6	177 24.4	·11 00.5	345 23.0	·· 20.9	161 02.3	·· 13.4	93 32.1	·· 22.0	92 57.2	96	·20 13.0	− 38
22	346 31.0	192 24.1	10 59.6	0 25.6	20.7	176 04.3	13.2	108 34.3	22.1	107 25.8	96	20 16.8	− 36
23	1 33.5	207 23.8	58.8	15 28.2	20.6	191 06.3	13.0	123 36.6	22.1	121 54.4	95	20 20.4	− 36
8 00	16 36.0	222 23.5	+10 57.9	30 30.9	−10 20.4	206 08.3	+ 5 12.8	138 38.8	−18 22.2	136 22.9	96	−20 24.0	− 34
01	31 38.4	237 23.2	57.0	45 33.5	20.3	221 10.2	12.6	153 41.0	22.2	150 51.5	96	20 27.4	− 33
02	46 40.9	252 22.8	56.2	60 36.1	20.1	236 12.2	12.4	168 43.2	22.3	165 20.1	97	20 30.7	− 32
03	61 43.4	267 22.5	·· 55.3	75 38.7	·· 20.0	251 14.2	·· 12.2	183 45.4	·· 22.4	179 48.8	96	·20 33.9	− 31
04	76 45.8	282 22.2	54.4	90 41.3	19.8	266 16.2	12.0	198 47.7	22.4	194 17.4	97	20 37.0	− 29
05	91 48.3	297 21.9	53.6	105 43.9	19.6	281 18.2	11.8	213 49.9	22.5	208 46.1	96	20 39.9	− 29
06	106 50.8	312 21.6	+10 52.7	120 46.6	−10 19.5	296 20.2	+ 5 11.6	228 52.1	−18 22.5	223 14.7	97	−20 42.8	− 27
07	121 53.2	327 21.3	51.8	135 49.2	19.3	311 22.2	11.4	243 54.3	22.6	237 43.4	97	20 45.5	− 26
08	136 55.7	342 21.0	51.0	150 51.8	19.2	326 24.2	11.2	258 56.5	22.6	252 12.1	98	20 48.1	− 25
09	151 58.1	357 20.7	·· 50.1	165 54.4	·· 19.0	341 26.2	·· 11.0	273 58.8	·· 22.7	266 40.9	97	·20 50.6	− 24
10	167 00.6	12 20.4	49.2	180 57.0	18.8	356 28.1	10.8	289 01.0	22.8	281 09.6	98	20 53.0	− 23
11	182 03.1	27 20.1	48.4	195 59.6	18.7	11 30.1	10.6	304 03.2	22.8	295 38.4	98	20 55.3	− 22
12	197 05.5	42 19.8	+10 47.5	211 02.2	−10 18.5	26 32.1	+ 5 10.4	319 05.4	−18 22.9	310 07.2	98	−20 57.5	− 20
13	212 08.0	57 19.4	46.6	226 04.8	18.4	41 34.1	10.2	334 07.6	22.9	324 36.0	98	20 59.5	− 20
14	227 10.5	72 19.1	45.7	241 07.4	18.2	56 36.1	10.0	349 09.9	23.0	339 04.8	99	21 01.5	− 18
15	242 12.9	87 18.8	·· 44.9	256 10.0	·· 18.0	71 38.1	·· 09.8	4 12.1	·· 23.0	353 33.7	98	·21 03.3	− 18
16	257 15.4	102 18.5	44.0	271 12.6	17.9	86 40.1	09.6	19 14.3	23.1	8 02.5	99	21 05.1	− 16
17	272 17.9	117 18.2	43.1	286 15.2	17.7	101 42.1	09.5	34 16.5	23.2	22 31.4	100	21 06.7	− 15
18	287 20.3	132 17.9	+10 42.3	301 17.8	−10 17.5	116 44.1	+ 5 09.3	49 18.7	−18 23.2	37 00.4	99	−21 08.2	− 13
19	302 22.8	147 17.6	41.4	316 20.4	17.4	131 46.0	09.1	64 21.0	23.3	51 29.3	100	21 09.5	− 13
20	317 25.3	162 17.3	40.5	331 23.0	17.2	146 48.0	08.9	79 23.2	23.3	65 58.3	100	21 10.8	− 12
21	332 27.7	177 17.0	·· 39.6	346 25.6	·· 17.0	161 50.0	·· 08.7	94 25.4	·· 23.4	80 27.3	100	·21 12.0	− 10
22	347 30.2	192 16.7	38.7	1 28.2	16.9	176 52.0	08.5	109 27.6	23.4	94 56.3	101	21 13.0	− 10
23	2 32.6	207 16.4	37.9	16 30.8	16.7	191 54.0	08.3	124 29.8	23.5	109 25.4	101	21 14.0	− 8
24	17 35.1	222 16.0	+10 37.0	31 33.4	−10 16.5	206 56.0	+ 5 08.1	139 32.1	−18 23.6	123 54.5	101	−21 14.8	− 7
code	—	− 3	− 9	+ 26	+ 2	+ 20	− 2	+ 22	− 1				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
6 00	182 56.2	− 5 01.4	7	Acamar	315 50.2	−40 28.4
01	197 56.4	02.3	5	Achernar	335 57.7	−57 27.2
02	212 56.6	03.3	30	Acrux	173 57.6	−62 51.6
03	227 56.8	·· 04.2	19	Adhara	255 45.9	−28 54.5
04	242 56.9	05.2	10	Aldebaran	291 38.0	+16 25.5
05	257 57.1	06.2				
06	272 57.3	− 5 07.1	32	Alioth	166 58.5	+56 11.6
07	287 57.5	08.1	34	Alkaid	153 32.8	+49 31.8
08	302 57.7	09.0	55	Al Na'ir	28 36.7	−47 10.2
09	317 57.9	·· 10.0	15	Alnilam	276 29.4	− 1 13.6
10	332 58.0	11.0	25	Alphard	218 38.0	− 8 28.2
11	347 58.2	11.9				
12	2 58.4	− 5 12.9	41	Alphecca	126 47.3	+26 51.7
13	17 58.6	13.8	1	Alpheratz	358 27.2	+28 51.4
14	32 58.8	14.8	51	Altair	62 49.6	+ 8 45.5
15	47 58.9	·· 15.8	2	Ankaa	353 57.1	−42 32.3
16	62 59.1	16.7	42	Antares	113 18.7	−26 20.2
17	77 59.3	17.7				
18	92 59.5	− 5 18.6	37	Arcturus	146 34.8	+19 24.5
19	107 59.7	19.6	43	Atria	108 59.0	−68 57.2
20	122 59.8	20.6	22	Avior	234 35.6	−59 22.0
21	138 00.0	·· 21.5	13	Bellatrix	279 17.5	+ 6 18.8
22	153 00.2	22.5	16	Betelg'se	271 47.2	+ 7 24.1
23	168 00.4	23.4				
			17	Canopus	264 14.9	−52 40.0
7 00	183 00.6	− 5 24.4	12	Capella	281 37.1	+45 57.2
01	198 00.7	25.3	53	Deneb	50 00.3	+45 07.9
02	213 00.9	26.3	28	Denebola	183 17.3	+14 48.8
03	228 01.1	·· 27.3	4	Diphda	349 38.2	−18 13.2
04	243 01.3	28.2				
05	258 01.5	29.2	27	Dubhe	194 44.3	+61 58.9
06	273 01.6	− 5 30.1	14	Elnath	279 06.2	+28 34.3
07	288 01.8	31.1	47	Eltanin	91 06.0	+51 30.0
08	303 02.0	32.1	54	Enif	34 28.6	+ 9 40.8
09	318 02.2	·· 33.0	56	Fomalhaut	16 10.5	−29 51.0
10	333 02.3	34.0				
11	348 02.5	34.9	31	Gacrux	172 48.9	−56 52.3
12	3 02.7	− 5 35.9	29	Gienah	176 36.4	−17 18.1
13	18 02.9	36.8	35	Hadar	149 48.9	−60 10.0
14	33 03.1	37.8	6	Hamal	328 48.5	+23 15.7
15	48 03.2	·· 38.7	48	Kaus Aust.	84 40.2	−34 24.4
16	63 03.4	39.7				
17	78 03.6	40.7	40	Kochab	137 19.1	+74 20.1
18	93 03.8	− 5 41.6	57	Markab	14 20.4	+14 58.6
19	108 03.9	42.6	8	Menkar	314 59.3	+ 3 55.4
20	123 04.1	43.5	36	Menkent	148 58.1	−36 09.5
21	138 04.3	·· 44.5	24	Miapl'dus	221 49.3	−69 32.2
22	153 04.5	45.4				
23	168 04.6	46.4	9	Mirfak	309 40.9	+49 42.5
			50	Nunki	76 51.0	−26 21.1
8 00	183 04.8	− 5 47.4	52	Peacock	54 25.9	−56 52.6
01	198 05.0	48.3	21	Pollux	244 19.7	+28 07.8
02	213 05.2	49.3	20	Procyon	245 44.2	+ 5 20.2
03	228 05.3	·· 50.2				
04	243 05.5	51.2	46	R'alhague	96 46.0	+12 35.7
05	258 05.7	52.1	26	Regulus	208 28.9	+12 10.7
06	273 05.9	− 5 53.1	11	Rigel	281 52.8	− 8 14.9
07	288 06.0	54.0	38	Rigil Kent.	140 50.5	−60 39.6
08	303 06.2	55.0	44	Sabik	103 01.5	−15 40.3
09	318 06.4	·· 55.9				
10	333 06.6	56.9	3	Schedar	350 28.5	+56 18.2
11	348 06.7	57.9	45	Shaula	97 19.8	−37 04.5
12	3 06.9	− 5 58.8	18	Sirius	259 11.2	−16 39.2
13	18 07.1	5 59.8	33	Spica	159 16.4	−10 56.1
14	33 07.2	6 00.7	23	Suhail	223 24.0	−43 15.3
15	48 07.4	·· 01.7				
16	63 07.6	02.6	49	Vega	81 07.8	+38 44.9
17	78 07.8	03.6	39	Zub'g'bi	137 52.8	−15 51.7
18	93 07.9	− 6 04.5				
19	108 08.1	05.5				
20	123 08.3	06.4				
21	138 08.4	·· 07.4				
22	153 08.6	08.3				
23	168 08.8	09.3				
24	183 09.0	− 6 10.2				
code	—	− 9				

Lat.	Sunrise	Twlt. begins
N °	h m	h m
72	6 46	2 44
70	6 40	3 05
68	6 34	3 20
66	6 30	3 33
64	6 26	3 43
62	6 23	3 51
60	6 20	3 58
58	6 17	4 04
56	6 15	4 09
54	6 13	4 13
52	6 11	4 17
50	6 09	4 21
45	6 05	4 27
40	6 02	4 31
35	5 59	4 35
30	5 57	4 37
20	5 52	4 39
10	5 48	4 38
0	5 44	4 36
10	5 41	4 31
20	5 36	4 23
30	5 31	4 11
35	5 28	4 04
40	5 25	3 53
45	5 21	3 40
50	5 16	3 23
52	5 14	3 14
54	5 12	3 05
56	5 09	2 53
58	5 06	2 40
60	5 02	2 24
S		

Moonrise	6	7	8	9
	h m	h m	h m	h m
72	12 34			
70	11 30	14 05		
68	10 55	12 41	14 17	15 16
66	10 30	12 04	13 23	14 19
64	10 10	11 37	12 50	13 46
62	9 55	11 16	12 26	13 21
60	9 42	11 00	12 07	13 02
58	9 30	10 46	11 51	12 46
56	9 20	10 34	11 38	12 32
54	9 12	10 23	11 26	12 20
52	9 04	10 14	11 16	12 10
50	8 57	10 06	11 07	12 00
45	8 42	9 48	10 48	11 41
40	8 30	9 34	10 32	11 25
35	8 20	9 21	10 19	11 11
30	8 11	9 11	10 07	10 59
20	7 56	8 53	9 47	10 39
10	7 42	8 37	9 30	10 22
0	7 30	8 22	9 14	10 06
10	7 18	8 08	8 58	9 49
20	7 04	7 52	8 41	9 32
30	6 49	7 34	8 22	9 12
35	6 41	7 24	8 10	9 00
40	6 31	7 12	7 57	8 47
45	6 19	6 58	7 42	8 31
50	6 05	6 41	7 23	8 11
52	5 59	6 33	7 14	8 02
54	5 52	6 25	7 05	7 52
56	5 44	6 15	6 53	7 40
58	5 35	6 04	6 40	7 26
60	5 25	5 51	6 26	7 11

Lat.	Sunset	Twlt. ends
N °	h m	h m
72	16 47	20 44
70	16 54	20 24
68	17 00	20 10
66	17 04	19 58
64	17 08	19 48
62	17 12	19 41
60	17 15	19 34
58	17 17	19 28
56	17 20	19 24
54	17 22	19 20
52	17 24	19 16
50	17 26	19 13
45	17 30	19 07
40	17 33	19 03
35	17 36	19 00
30	17 38	18 57
20	17 43	18 56
10	17 47	18 57
0	17 51	19 00
10	17 55	19 05
20	18 00	19 14
30	18 05	19 26
35	18 08	19 35
40	18 12	19 46
45	18 16	19 59
50	18 21	20 17
52	18 23	20 25
54	18 25	20 35
56	18 28	20 47
58	18 31	21 01
60	18 35	21 19
S		

Moonset	6	7	8	9
	h m	h m	h m	h m
72	14 37			
70	15 42	14 57		
68	16 18	16 21	16 33	17 21
66	16 44	16 59	17 28	18 17
64	17 04	17 26	18 01	18 51
62	17 21	17 47	18 25	19 15
60	17 34	18 04	18 44	19 35
58	17 46	18 18	19 00	19 51
56	17 56	18 31	19 13	20 04
54	18 05	18 42	19 25	20 16
52	18 14	18 51	19 36	20 27
50	18 21	19 00	19 45	20 36
45	18 36	19 18	20 04	20 55
40	18 49	19 33	20 20	21 11
35	19 00	19 45	20 34	21 25
30	19 10	19 56	20 45	21 36
20	19 27	20 15	21 05	21 56
10	19 41	20 32	21 23	22 14
0	19 55	20 47	21 39	22 30
10	20 09	21 03	21 55	22 46
20	20 23	21 19	22 13	23 03
30	20 40	21 38	22 33	23 23
35	20 50	21 49	22 44	23 34
40	21 01	22 02	22 58	23 48
45	21 14	22 17	23 13	24 03
50	21 30	22 35	23 33	24 22
52	21 38	22 44	23 42	24 31
54	21 46	22 54	23 53	24 42
56	21 56	23 05	24 04	0 04
58	22 06	23 18	24 18	0 18
60	22 19	23 32	24 34	0 34

GMT	Equation of Time (App.−Mean) 6	7	8
h	m s	m s	m s
0	+11 44.5	+12 01.9	+12 18.9
6	+11 48.9	+12 06.2	+12 23.1
12	+11 53.2	+12 10.5	+12 27.3
18	+11 57.6	+12 14.7	+12 31.4
24	+12 01.9	+12 18.9	+12 35.5

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
6	13 42	9 10	22 03	10 20	14 50
7	14 35	9 10	21 58	10 17	14 47
8	15 27	9 11	21 54	10 14	14 43
9	16 18	9 11	21 50	10 11	14 40

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.3	0.1	0.3
30	0.3	0.1	0.3
45	0.3	0.1	0.2
60	0.3	0.1	0.1
75	0.3	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	6	7	8
°	′	′	′
0	16.1	15.0	14.2
4	16.1	15.0	14.2
8	16.1	15.0	14.2
12	16.0	15.1	14.2
16	16.0	15.1	14.2
20	16.0	15.1	14.2
24	16.0	15.1	14.3
28	16.0	15.1	14.3
32	16.0	15.1	14.3
36	16.0	15.1	14.4
40	16.0	15.1	14.4
44	15.9	15.2	14.5
48	15.9	15.2	14.5
52	15.9	15.2	14.6
56	15.9	15.2	14.7
60	15.8	15.3	14.7
64	15.8	15.3	14.8
68	15.8	15.3	14.9
72	15.8	15.3	14.9
76	15.7	15.4	15.0
80	15.7	15.4	15.1
84	15.7	15.4	15.2
88	15.7	15.4	15.2
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	6	7	8
°	′	′	′
0	15.3	15.8	16.4
4	15.3	15.8	16.3
8	15.3	15.8	16.3
12	15.3	15.8	16.3
16	15.3	15.8	16.3
20	15.3	15.8	16.3
24	15.3	15.8	16.2
28	15.3	15.8	16.2
32	15.3	15.8	16.2
36	15.3	15.8	16.1
40	15.4	15.7	16.1
44	15.4	15.7	16.0
48	15.4	15.7	16.0
52	15.4	15.7	15.9
56	15.4	15.7	15.8
60	15.5	15.6	15.8
64	15.5	15.6	15.7
68	15.5	15.6	15.6
72	15.5	15.6	15.6
76	15.6	15.5	15.5
80	15.6	15.5	15.4
84	15.6	15.5	15.3
88	15.7	15.4	15.3
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.7 GHA	VENUS −3.7 Dec.	MARS −1.9 GHA	MARS −1.9 Dec.	JUPITER −1.3 GHA	JUPITER −1.3 Dec.	SATURN 0.8 GHA	SATURN 0.8 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
9 00	17 35.1	222 16.0	+10 37.0	31 33.4	−10 16.5	206 56.0	+ 5 08.1	139 32.1	−18 23.6	123 54.5	101	−21 14.8	− 7
01	32 37.6	237 15.7	36.1	46 36.0	16.4	221 58.0	07.9	154 34.3	23.6	138 23.6	101	21 15.5	− 6
02	47 40.0	252 15.4	35.2	61 38.6	16.2	237 00.0	07.7	169 36.5	23.7	152 52.7	102	21 16.1	− 5
03	62 42.5	267 15.1	34.4	76 41.1	16.0	252 02.0	07.5	184 38.7	23.7	167 21.9	102	·21 16.6	− 4
04	77 45.0	282 14.8	33.5	91 43.7	15.9	267 03.9	07.3	199 40.9	23.8	181 51.1	102	21 17.0	− 3
05	92 47.4	297 14.5	32.6	106 46.3	15.7	282 05.9	07.1	214 43.2	23.8	196 20.3	103	21 17.3	− 2
06	107 49.9	312 14.2	+10 31.7	121 48.9	−10 15.5	297 07.9	+ 5 06.9	229 45.4	−18 23.9	210 49.6	103	−21 17.5	− 1
07	122 52.4	327 13.9	30.8	136 51.5	15.3	312 09.9	06.7	244 47.6	24.0	225 18.9	103	21 17.6	+ 1
08	137 54.8	342 13.6	29.9	151 54.0	15.2	327 11.9	06.5	259 49.8	24.0	239 48.2	104	21 17.5	+ 1
09	152 57.3	357 13.3	29.1	166 56.6	15.0	342 13.9	06.3	274 52.0	24.1	254 17.6	103	·21 17.4	+ 3
10	167 59.7	12 13.0	28.2	181 59.2	14.8	357 15.9	06.1	289 54.2	24.1	268 46.9	105	21 17.1	+ 4
11	183 02.2	27 12.7	27.3	197 01.8	14.6	12 17.9	05.9	304 56.5	24.2	283 16.4	104	21 16.7	+ 4
12	198 04.7	42 12.3	+10 26.4	212 04.3	−10 14.5	27 19.9	+ 5 05.7	319 58.7	−18 24.2	297 45.8	105	−21 16.3	+ 6
13	213 07.1	57 12.0	25.5	227 06.9	14.3	42 21.9	05.5	335 00.9	24.3	312 15.3	105	21 15.7	+ 7
14	228 09.6	72 11.7	24.6	242 09.5	14.1	57 23.8	05.3	350 03.1	24.4	326 44.8	106	21 15.0	+ 8
15	243 12.1	87 11.4	23.7	257 12.1	13.9	72 25.8	05.1	5 05.3	24.4	341 14.4	106	·21 14.2	+ 9
16	258 14.5	102 11.1	22.9	272 14.6	13.8	87 27.8	04.9	20 07.6	24.5	355 44.0	106	21 13.3	+ 10
17	273 17.0	117 10.8	22.0	287 17.2	13.6	102 29.8	04.7	35 09.8	24.5	10 13.6	107	21 12.3	+ 11
18	288 19.5	132 10.5	+10 21.1	302 19.8	−10 13.4	117 31.8	+ 5 04.5	50 12.0	−18 24.6	24 43.3	107	−21 11.2	+ 12
19	303 21.9	147 10.2	20.2	317 22.3	13.2	132 33.8	04.3	65 14.2	24.6	39 13.0	108	21 10.0	+ 13
20	318 24.4	162 09.9	19.3	332 24.9	13.0	147 35.8	04.1	80 16.4	24.7	53 42.8	108	21 08.7	+ 15
21	333 26.9	177 09.6	18.4	347 27.5	12.9	162 37.8	03.9	95 18.6	24.8	68 12.6	108	·21 07.2	+ 15
22	348 29.3	192 09.3	17.5	2 30.0	12.7	177 39.8	03.8	110 20.9	24.8	82 42.4	108	21 05.7	+ 16
23	3 31.8	207 09.0	16.6	17 32.6	12.5	192 41.8	03.6	125 23.1	24.9	97 12.2	109	21 04.1	+ 17
10 00	18 34.2	222 08.7	+10 15.7	32 35.1	−10 12.3	207 43.8	+ 5 03.4	140 25.3	−18 24.9	111 42.1	110	−21 02.4	+ 19
01	33 36.7	237 08.3	14.8	47 37.7	12.1	222 45.7	03.2	155 27.5	25.0	126 12.1	110	21 00.5	+ 19
02	48 39.2	252 08.0	14.0	62 40.2	12.0	237 47.7	03.0	170 29.7	25.0	140 42.1	110	20 58.6	+ 20
03	63 41.6	267 07.7	13.1	77 42.8	11.8	252 49.7	02.8	185 31.9	25.1	155 12.1	110	·20 56.6	+ 22
04	78 44.1	282 07.4	12.2	92 45.3	11.6	267 51.7	02.6	200 34.2	25.2	169 42.1	111	20 54.4	+ 22
05	93 46.6	297 07.1	11.3	107 47.9	11.4	282 53.7	02.4	215 36.4	25.2	184 12.2	112	20 52.2	+ 23
06	108 49.0	312 06.8	+10 10.4	122 50.4	−10 11.2	297 55.7	+ 5 02.2	230 38.6	−18 25.3	198 42.4	112	−20 49.9	+ 25
07	123 51.5	327 06.5	09.5	137 53.0	11.0	312 57.7	02.0	245 40.8	25.3	213 12.6	112	20 47.4	+ 25
08	138 54.0	342 06.2	08.6	152 55.5	10.9	327 59.7	01.8	260 43.0	25.4	227 42.8	113	20 44.9	+ 26
09	153 56.4	357 05.9	07.7	167 58.1	10.7	343 01.7	01.6	275 45.2	25.4	242 13.1	113	·20 42.3	+ 27
10	168 58.9	12 05.6	06.8	183 00.6	10.5	358 03.7	01.4	290 47.4	25.5	256 43.4	113	20 39.6	+ 29
11	184 01.4	27 05.3	05.9	198 03.2	10.3	13 05.7	01.2	305 49.7	25.6	271 13.7	114	20 36.7	+ 29
12	199 03.8	42 05.0	+10 05.0	213 05.7	−10 10.1	28 07.7	+ 5 01.0	320 51.9	−18 25.6	285 44.1	114	−20 33.8	+ 30
13	214 06.3	57 04.7	04.1	228 08.3	09.9	43 09.6	00.8	335 54.1	25.7	300 14.5	115	20 30.8	+ 31
14	229 08.7	72 04.3	03.2	243 10.8	09.7	58 11.6	00.6	350 56.3	25.7	314 45.0	115	20 27.7	+ 32
15	244 11.2	87 04.0	02.3	258 13.3	09.5	73 13.6	00.4	5 58.5	25.8	329 15.5	116	·20 24.5	+ 33
16	259 13.7	102 03.7	01.4	273 15.9	09.3	88 15.6	00.2	21 00.7	25.8	343 46.1	116	20 21.2	+ 34
17	274 16.1	117 03.4	10 00.5	288 18.4	09.2	103 17.6	5 00.0	36 03.0	25.9	358 16.7	117	20 17.8	+ 35
18	289 18.6	132 03.1	+ 9 59.6	303 20.9	−10 09.0	118 19.6	+ 4 59.8	51 05.2	−18 26.0	12 47.4	117	−20 14.3	+ 36
19	304 21.1	147 02.8	58.7	318 23.5	08.8	133 21.6	59.6	66 07.4	26.0	27 18.1	117	20 10.7	+ 37
20	319 23.5	162 02.5	57.8	333 26.0	08.6	148 23.6	59.4	81 09.6	26.1	41 48.8	118	20 07.0	+ 38
21	334 26.0	177 02.2	56.9	348 28.5	08.4	163 25.6	59.2	96 11.8	26.1	56 19.6	118	·20 03.2	+ 38
22	349 28.5	192 01.9	56.0	3 31.1	08.2	178 27.6	59.1	111 14.0	26.2	70 50.4	119	19 59.4	+ 40
23	4 30.9	207 01.6	55.0	18 33.6	08.0	193 29.6	58.9	126 16.2	26.2	85 21.3	119	19 55.4	+ 40
11 00	19 33.4	222 01.3	+ 9 54.1	33 36.1	−10 07.8	208 31.6	+ 4 58.7	141 18.5	−18 26.3	99 52.2	120	−19 51.4	+ 42
01	34 35.8	237 01.0	53.2	48 38.6	07.6	223 33.6	58.5	156 20.7	26.4	114 23.2	120	19 47.2	+ 42
02	49 38.3	252 00.7	52.3	63 41.2	07.4	238 35.6	58.3	171 22.9	26.4	128 54.2	120	19 43.0	+ 43
03	64 40.8	267 00.4	51.4	78 43.7	07.2	253 37.5	58.1	186 25.1	26.5	143 25.2	121	·19 38.7	+ 44
04	79 43.2	282 00.0	50.5	93 46.2	07.0	268 39.5	57.9	201 27.3	26.5	157 56.3	121	19 34.3	+ 45
05	94 45.7	296 59.7	49.6	108 48.7	06.8	283 41.5	57.7	216 29.5	26.6	172 27.4	122	19 29.8	+ 46
06	109 48.2	311 59.4	+ 9 48.7	123 51.2	−10 06.6	298 43.5	+ 4 57.5	231 31.7	−18 26.6	186 58.6	122	−19 25.2	+ 46
07	124 50.6	326 59.1	47.8	138 53.8	06.4	313 45.5	57.3	246 34.0	26.7	201 29.8	123	19 20.6	+ 48
08	139 53.1	341 58.8	46.9	153 56.3	06.2	328 47.5	57.1	261 36.2	26.8	216 01.1	123	19 15.8	+ 48
09	154 55.6	356 58.5	46.0	168 58.8	06.0	343 49.5	56.9	276 38.4	26.8	230 32.4	124	·19 11.0	+ 49
10	169 58.0	11 58.2	45.0	184 01.3	05.8	358 51.5	56.7	291 40.6	26.9	245 03.8	124	19 06.1	+ 50
11	185 00.5	26 57.9	44.1	199 03.8	05.6	13 53.5	56.5	306 42.8	26.9	259 35.2	124	19 01.1	+ 51
12	200 03.0	41 57.6	+ 9 43.2	214 06.3	−10 05.4	28 55.5	+ 4 56.3	321 45.0	−18 27.0	274 06.6	125	−18 56.0	+ 52
13	215 05.4	56 57.3	42.3	229 08.8	05.2	43 57.5	56.1	336 47.2	27.0	288 38.1	126	18 50.8	+ 53
14	230 07.9	71 57.0	41.4	244 11.3	05.0	58 59.5	55.9	351 49.4	27.1	303 09.7	125	18 45.5	+ 53
15	245 10.3	86 56.7	40.5	259 13.9	04.8	74 01.5	55.7	6 51.7	27.2	317 41.2	127	·18 40.2	+ 54
16	260 12.8	101 56.4	39.6	274 16.4	04.6	89 03.5	55.5	21 53.9	27.2	332 12.9	126	18 34.8	+ 55
17	275 15.3	116 56.1	38.6	289 18.9	04.4	104 05.5	55.3	36 56.1	27.3	346 44.5	127	18 29.3	+ 56
18	290 17.7	131 55.8	+ 9 37.7	304 21.4	−10 04.2	119 07.5	+ 4 55.1	51 58.3	−18 27.3	1 16.2	128	−18 23.7	+ 57
19	305 20.2	146 55.4	36.8	319 23.9	04.0	134 09.5	55.0	67 00.5	27.4	15 48.0	128	18 18.0	+ 57
20	320 22.7	161 55.1	35.9	334 26.4	03.8	149 11.5	54.8	82 02.7	27.4	30 19.8	128	18 12.3	+ 58
21	335 25.1	176 54.8	35.0	349 28.9	03.6	164 13.4	54.6	97 04.9	27.5	44 51.6	129	·18 06.5	+ 60
22	350 27.6	191 54.5	34.0	4 31.4	03.4	179 15.4	54.4	112 07.1	27.6	59 23.5	129	18 00.5	+ 59
23	5 30.1	206 54.2	33.1	19 33.9	03.2	194 17.4	54.2	127 09.4	27.6	73 55.4	130	17 54.6	+ 61
24	20 32.5	221 53.9	+ 9 32.2	34 36.4	−10 03.0	209 19.4	+ 4 54.0	142 11.6	−18 27.7	88 27.4	130	−17 48.5	+ 61
code	—	− 3	− 9	+ 26	+ 2	+ 19	− 2	+ 22	− 1				

G M T	SUN GHA	SUN Dec.
h	° ′	° ′
9 00	183 09.0	− 6 10.2
01	198 09.1	11.2
02	213 09.3	12.1
03	228 09.5	·· 13.1
04	243 09.6	14.0
05	258 09.8	15.0
06	273 10.0	− 6 15.9
07	288 10.2	16.9
08	303 10.3	17.8
09	318 10.5	·· 18.8
10 00	333 10.7	19.7
01	348 10.8	20.7
02	3 11.0	− 6 21.6
03	18 11.2	22.6
04	33 11.3	23.5
05	48 11.5	·· 24.5
06	63 11.7	25.4
07	78 11.8	26.4
08	93 12.0	− 6 27.3
09	108 12.2	28.3
10	123 12.3	29.2
11	138 12.5	·· 30.2
12	153 12.7	31.1
13	168 12.8	32.1
14 00	183 13.0	− 6 33.0
01	198 13.2	34.0
02	213 13.3	34.9
03	228 13.5	·· 35.9
04	243 13.7	36.8
05	258 13.8	37.8
06	273 14.0	− 6 38.7
07	288 14.2	39.7
08	303 14.3	40.6
09	318 14.5	·· 41.6
10	333 14.7	42.5
11	348 14.8	43.5
12	3 15.0	− 6 44.4
13	18 15.1	45.4
14	33 15.3	46.3
15	48 15.5	·· 47.2
16	63 15.6	48.2
17	78 15.8	49.1
18	93 16.0	− 6 50.1
19	108 16.1	51.0
20	123 16.3	52.0
21	138 16.4	·· 52.9
22	153 16.6	53.9
23	168 16.8	54.8
11 00	183 16.9	− 6 55.8
01	198 17.1	56.7
02	213 17.3	57.6
03	228 17.4	·· 58.6
04	243 17.6	6 59.5
05	258 17.7	7 00.5
06	273 17.9	− 7 01.4
07	288 18.1	02.4
08	303 18.2	03.3
09	318 18.4	·· 04.2
10	333 18.5	05.2
11	348 18.7	06.1
12	3 18.9	− 7 07.1
13	18 19.0	08.0
14	33 19.2	09.0
15	48 19.3	·· 09.9
16	63 19.5	10.8
17	78 19.6	11.8
18	93 19.8	− 7 12.7
19	108 20.0	13.7
20	123 20.1	14.6
21	138 20.3	·· 15.5
22	153 20.4	16.5
23	168 20.6	17.4
24	183 20.7	− 7 18.4
Mode	−	− 10

STARS No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 50.2	−40 28.4
5	Achernar	335 57.7	−57 27.2
30	Acrux	173 57.6	−62 51.6
19	Adhara	255 45.9	−28 54.5
10	Aldebaran	291 38.0	+16 25.5
32	Alioth	166 58.5	+56 11.6
34	Alkaid	153 32.8	+49 31.8
55	Al Na'ir	28 36.7	−47 10.2
15	Alnilam	276 29.4	− 1 13.6
25	Alphard	218 38.0	− 8 28.2
41	Alphecca	126 47.3	+26 51.7
1	Alpheratz	358 27.2	+28 51.4
51	Altair	62 49.6	+ 8 45.5
2	Ankaa	353 57.1	−42 32.3
42	Antares	113 18.7	−26 20.2
37	Arcturus	146 34.8	+19 24.5
43	Atria	108 59.0	−68 57.2
22	Avior	234 35.6	−59 22.0
13	Bellatrix	279 17.5	+ 6 18.8
16	Betelg'se	271 47.2	+ 7 24.1
17	Canopus	264 14.9	−52 40.0
12	Capella	281 37.1	+45 57.2
53	Deneb	50 00.3	+45 07.9
28	Denebola	183 17.3	+14 48.8
4	Diphda	349 38.2	−18 13.2
27	Dubhe	194 44.3	+61 58.9
14	Elnath	279 06.2	+28 34.3
47	Eltanin	91 06.1	+51 30.0
54	Enif	34 28.7	+ 9 40.8
56	Fomalhaut	16 10.5	−29 51.0
31	Gacrux	172 48.9	−56 52.2
29	Gienah	176 36.4	−17 18.1
35	Hadar	149 48.9	−60 10.0
6	Hamal	328 48.4	+23 15.7
48	Kaus Aust.	84 40.3	−34 24.4
40	Kochab	137 19.1	+74 20.1
57	Markab	14 20.4	+14 58.6
8	Menkar	314 59.2	+ 3 55.4
36	Menkent	148 58.1	−36 09.5
24	Miapl'dus	221 49.2	−69 32.1
9	Mirfak	309 40.9	+49 42.5
50	Nunki	76 51.0	−26 21.1
52	Peacock	54 26.0	−56 52.6
21	Pollux	244 19.7	+28 07.8
20	Procyon	245 44.2	+ 5 20.2
46	R'alhague	96 46.0	+12 35.7
26	Regulus	208 28.9	+12 10.7
11	Rigel	281 52.8	− 8 14.9
38	Rigil Kent.	140 50.5	−60 39.6
44	Sabik	103 01.5	−15 40.3
3	Schedar	350 28.5	+56 18.2
45	Shaula	97 19.8	−37 04.5
18	Sirius	259 11.1	−16 39.2
33	Spica	159 16.4	−10 56.1
23	Suhail	223 23.9	−43 15.3
49	Vega	81 07.8	+38 44.9
39	Zub'g'bi	137 52.8	−15 51.7

Lat. N °	Sunrise h m	Twlt. begins h m
72	7 00	3 02
70	6 52	3 20
68	6 45	3 33
66	6 40	3 43
64	6 35	3 52
62	6 31	4 00
60	6 27	4 06
58	6 24	4 11
56	6 21	4 15
54	6 18	4 19
52	6 16	4 22
50	6 14	4 25
45	6 09	4 31
40	6 05	4 34
35	6 02	4 37
30	5 59	4 39
20	5 53	4 40
10	5 48	4 38
0	5 44	4 35
10	5 39	4 28
20	5 34	4 21
30	5 28	4 07
35	5 24	3 58
40	5 20	3 48
45	5 15	3 33
50	5 10	3 15
52	5 07	3 05
54	5 04	2 55
56	5 01	2 43
58	4 57	2 27
60	4 54	2 09
S		

Moonrise 9 h m	10 h m	11 h m	12 h m
▬	▬	▬	16 46
▬	▬	16 24	16 06
15 16	15 34	15 38	15 39
14 19	14 51	15 08	15 17
13 46	14 22	14 46	15 01
13 21	14 00	14 28	14 47
13 02	13 43	14 13	14 35
12 46	13 28	14 00	14 25
12 32	13 15	13 49	14 16
12 20	13 04	13 39	14 08
12 10	12 54	13 31	14 00
12 00	12 45	13 23	13 54
11 41	12 27	13 06	13 40
11 25	12 11	12 52	13 29
11 11	11 58	12 41	13 19
10 59	11 47	12 31	13 10
10 39	11 28	12 13	12 55
10 22	11 11	11 58	12 42
10 06	10 55	11 43	12 30
9 49	10 40	11 29	12 17
9 32	10 23	11 14	12 04
9 12	10 03	10 56	11 49
9 00	9 52	10 46	11 40
8 47	9 39	10 34	11 30
8 31	9 24	10 20	11 19
8 11	9 05	10 03	11 04
8 02	8 56	9 55	10 57
7 52	8 46	9 46	10 50
7 40	8 35	9 36	10 42
7 26	8 22	9 25	10 32
7 11	8 07	9 11	10 21

Lat. N °	Sunset h m	Twlt. ends h m
72	16 32	20 25
70	16 40	20 08
68	16 47	19 55
66	16 53	19 45
64	16 58	19 37
62	17 02	19 30
60	17 06	19 25
58	17 09	19 20
56	17 12	19 16
54	17 15	19 13
52	17 17	19 09
50	17 19	19 06
45	17 24	19 01
40	17 28	18 58
35	17 32	18 56
30	17 35	18 54
20	17 40	18 53
10	17 45	18 55
0	17 50	18 59
10	17 55	19 06
20	18 01	19 15
30	18 07	19 29
35	18 10	19 37
40	18 14	19 49
45	18 19	20 03
50	18 25	20 22
52	18 28	20 32
54	18 31	20 44
56	18 34	20 56
58	18 38	21 13
60	18 42	21 32
S		

Moonset 9 h m	10 h m	11 h m	12 h m
▬	▬	▬	20 50
▬	▬	19 35	21 28
17 21	18 46	20 20	21 55
18 17	19 28	20 49	22 15
18 51	19 56	21 12	22 31
19 15	20 18	21 29	22 44
19 35	20 36	21 44	22 56
19 51	20 50	21 56	23 05
20 04	21 03	22 07	23 14
20 16	21 14	22 16	23 21
20 27	21 23	22 24	23 28
20 36	21 32	22 32	23 34
20 55	21 50	22 48	23 47
21 11	22 05	23 01	23 58
21 25	22 18	23 12	24 07
21 36	22 29	23 22	24 15
21 56	22 47	23 38	24 28
22 14	23 04	23 53	24 40
22 30	23 19	24 06	0 06
22 46	23 34	24 19	0 19
23 03	23 50	24 34	0 34
23 23	24 08	0 08	0 50
23 34	24 19	0 19	0 59
23 48	24 31	0 31	1 10
24 03	0 03	0 46	1 22
24 22	0 22	1 03	1 38
24 31	0 31	1 12	1 45
24 42	0 42	1 21	1 53
0 04	0 53	1 31	2 01
0 18	1 06	1 43	2 11
0 34	1 21	1 57	2 23

G M T h	Equation of Time (App.—Mean) 9 m s	10 m s	11 m s
0	+12 35.5	+12 51.7	+13 07.4
6	+12 39.6	+12 55.7	+13 11.3
12	+12 43.6	+12 59.6	+13 15.1
18	+12 47.7	+13 03.5	+13 18.9
24	+12 51.7	+13 07.4	+13 22.7

DAY	GMT of Transit Meridian of Greenwich Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
9	16 18	9 11	21 50	10 11	14 40
10	17 07	9 12	21 46	10 08	14 36
11	17 55	9 12	21 42	10 05	14 33
12	18 41	9 13	21 38	10 01	14 29

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.3	0.1	0.3
30	0.3	0.1	0.3
45	0.3	0.1	0.2
60	0.3	0.1	0.1
75	0.3	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	9	10	11
°	′	′	′
0	13.3	12.6	12.2
4	13.3	12.6	12.3
8	13.3	12.7	12.3
12	13.3	12.7	12.3
16	13.3	12.7	12.4
20	13.4	12.8	12.4
24	13.4	12.9	12.5
28	13.5	12.9	12.6
32	13.6	13.0	12.7
36	13.6	13.1	12.8
40	13.7	13.2	12.9
44	13.8	13.3	13.0
48	13.9	13.4	13.2
52	14.0	13.6	13.3
56	14.1	13.7	13.5
60	14.2	13.8	13.6
64	14.3	14.0	13.8
68	14.4	14.1	14.0
72	14.6	14.3	14.1
76	14.7	14.4	14.3
80	14.8	14.6	14.5
84	14.9	14.8	14.7
88	15.0	14.9	14.8
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	9	10	11
°	′	′	′
0	16.9	17.2	17.4
4	16.8	17.2	17.4
8	16.8	17.2	17.4
12	16.8	17.2	17.4
16	16.8	17.1	17.3
20	16.7	17.1	17.3
24	16.7	17.0	17.2
28	16.6	16.9	17.1
32	16.6	16.8	17.0
36	16.5	16.7	16.9
40	16.4	16.6	16.8
44	16.3	16.5	16.6
48	16.2	16.4	16.5
52	16.1	16.3	16.4
56	16.0	16.1	16.2
60	15.9	16.0	16.1
64	15.8	15.9	15.9
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.3	15.2	15.2
84	15.2	15.1	15.0
88	15.1	15.0	14.9
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.7 GHA	Dec.	MARS −1.8 GHA	Dec.	JUPITER −1.3 GHA	Dec.	SATURN 0.8 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
12 00	20 32.5	221 53.9	+ 9 32.2	34 36.4	−10 03.0	209 19.4	+ 4 54.0	142 11.6	−18 27.7	88 27.4	130	−17 48.5	+ 61
01	35 35.0	236 53.6	31.3	49 38.8	02.8	224 21.4	53.8	157 13.8	27.7	102 59.4	131	17 42.4	+ 62
02	50 37.5	251 53.3	30.4	64 41.3	02.6	239 23.4	53.6	172 16.0	27.8	117 31.5	130	17 36.2	+ 63
03	65 39.9	266 53.0	·· 29.4	79 43.8	·· 02.4	254 25.4	·· 53.4	187 18.2	·· 27.9	132 03.5	132	·17 29.9	+ 64
04	80 42.4	281 52.7	28.5	94 46.3	02.2	269 27.4	53.2	202 20.4	27.9	146 35.7	132	17 23.5	+ 64
05	95 44.8	296 52.4	27.6	109 48.8	02.0	284 29.4	53.0	217 22.6	28.0	161 07.9	132	17 17.1	+ 66
06	110 47.3	311 52.1	+ 9 26.7	124 51.3	−10 01.8	299 31.4	+ 4 52.8	232 24.8	−18 28.0	175 40.1	132	−17 10.5	+ 65
07	125 49.8	326 51.8	25.7	139 53.8	01.6	314 33.4	52.6	247 27.0	28.1	190 12.3	133	17 04.0	+ 67
08	140 52.2	341 51.5	24.8	154 56.3	01.3	329 35.4	52.4	262 29.3	28.1	204 44.6	134	16 57.3	+ 67
09	155 54.7	356 51.2	·· 23.9	169 58.7	·· 01.1	344 37.4	·· 52.2	277 31.5	·· 28.2	219 17.0	133	·16 50.6	+ 68
10	170 57.2	11 50.9	23.0	185 01.2	00.9	359 39.4	52.0	292 33.7	28.3	233 49.3	135	16 43.8	+ 69
11	185 59.6	26 50.5	22.0	200 03.7	00.7	14 41.4	51.8	307 35.9	28.3	248 21.8	134	16 36.9	+ 70
12	201 02.1	41 50.2	+ 9 21.1	215 06.2	−10 00.5	29 43.4	+ 4 51.6	322 38.1	−18 28.4	262 54.2	135	−16 29.9	+ 70
13	216 04.6	56 49.9	20.2	230 08.7	00.3	44 45.4	51.5	337 40.3	28.4	277 26.7	136	16 22.9	+ 71
14	231 07.0	71 49.6	19.3	245 11.1	10 00.1	59 47.4	51.3	352 42.5	28.5	291 59.3	135	16 15.8	+ 71
15	246 09.5	86 49.3	·· 18.3	260 13.6	· 9 59.9	74 49.4	·· 51.1	7 44.7	·· 28.5	306 31.8	136	·16 08.7	+ 73
16	261 11.9	101 49.0	17.4	275 16.1	59.6	89 51.4	50.9	22 46.9	28.6	321 04.4	137	16 01.4	+ 73
17	276 14.4	116 48.7	16.5	290 18.6	59.4	104 53.4	50.7	37 49.2	28.7	335 37.1	137	15 54.1	+ 73
18	291 16.9	131 48.4	+ 9 15.5	305 21.0	− 9 59.2	119 55.4	+ 4 50.5	52 51.4	−18 28.7	350 09.8	137	−15 46.8	+ 75
19	306 19.3	146 48.1	14.6	320 23.5	59.0	134 57.4	50.3	67 53.6	28.8	4 42.5	138	15 39.3	+ 74
20	321 21.8	161 47.8	13.7	335 26.0	58.8	149 59.3	50.1	82 55.8	28.8	19 15.3	137	15 31.9	+ 76
21	336 24.3	176 47.5	·· 12.7	350 28.4	·· 58.6	165 01.3	·· 49.9	97 58.0	·· 28.9	33 48.0	139	·15 24.3	+ 76
22	351 26.7	191 47.2	11.8	5 30.9	58.4	180 03.3	49.7	113 00.2	29.0	48 20.9	138	15 16.7	+ 77
23	6 29.2	206 46.9	10.9	20 33.4	58.1	195 05.3	49.5	128 02.4	29.0	62 53.7	139	15 09.0	+ 78
13 00	21 31.7	221 46.6	+ 9 09.9	35 35.8	− 9 57.9	210 07.3	+ 4 49.3	143 04.6	−18 29.1	77 26.6	140	−15 01.2	+ 78
01	36 34.1	236 46.3	09.0	50 38.3	57.7	225 09.3	49.1	158 06.8	29.1	91 59.6	139	14 53.4	+ 79
02	51 36.6	251 46.0	08.1	65 40.7	57.5	240 11.3	48.9	173 09.0	29.2	106 32.5	141	14 45.5	+ 80
03	66 39.1	266 45.7	·· 07.1	80 43.2	·· 57.3	255 13.3	·· 48.7	188 11.3	·· 29.2	121 05.6	140	·14 37.5	+ 80
04	81 41.5	281 45.4	06.2	95 45.7	57.0	270 15.3	48.5	203 13.5	29.3	135 38.6	141	14 29.5	+ 80
05	96 44.0	296 45.0	05.3	110 48.1	56.8	285 17.3	48.4	218 15.7	29.4	150 11.7	141	14 21.5	+ 82
06	111 46.4	311 44.7	+ 9 04.3	125 50.6	− 9 56.6	300 19.3	+ 4 48.2	233 17.9	−18 29.4	164 44.8	141	−14 13.3	+ 82
07	126 48.9	326 44.4	03.4	140 53.0	56.4	315 21.3	48.0	248 20.1	29.5	179 17.9	142	14 05.1	+ 82
08	141 51.4	341 44.1	02.4	155 55.5	56.2	330 23.3	47.8	263 22.3	29.5	193 51.1	141	13 56.9	+ 83
09	156 53.8	356 43.8	·· 01.5	170 57.9	·· 55.9	345 25.3	·· 47.6	278 24.5	·· 29.6	208 24.2	143	·13 48.6	+ 84
10	171 56.3	11 43.5	9 00.6	186 00.4	55.7	0 27.3	47.4	293 26.7	29.6	222 57.5	142	13 40.2	+ 84
11	186 58.8	26 43.2	8 59.6	201 02.8	55.5	15 29.3	47.2	308 28.9	29.7	237 30.7	143	13 31.8	+ 85
12	202 01.2	41 42.9	+ 8 58.7	216 05.3	− 9 55.3	30 31.3	+ 4 47.0	323 31.1	−18 29.8	252 04.0	143	−13 23.3	+ 86
13	217 03.7	56 42.6	57.7	231 07.7	55.0	45 33.3	46.8	338 33.3	29.8	266 37.3	144	13 14.7	+ 86
14	232 06.2	71 42.3	56.8	246 10.2	54.8	60 35.3	46.6	353 35.5	29.9	281 10.7	143	13 06.1	+ 86
15	247 08.6	86 42.0	·· 55.9	261 12.6	·· 54.6	75 37.3	·· 46.4	8 37.8	·· 29.9	295 44.0	144	·12 57.5	+ 88
16	262 11.1	101 41.7	54.9	276 15.0	54.4	90 39.3	46.2	23 40.0	30.0	310 17.4	144	12 48.7	+ 87
17	277 13.5	116 41.4	54.0	291 17.5	54.1	105 41.3	46.0	38 42.2	30.1	324 50.8	145	12 40.0	+ 88
18	292 16.0	131 41.1	+ 8 53.0	306 19.9	− 9 53.9	120 43.3	+ 4 45.8	53 44.4	−18 30.1	339 24.3	145	−12 31.2	+ 89
19	307 18.5	146 40.8	52.1	321 22.4	53.7	135 45.3	45.6	68 46.6	30.2	353 57.8	145	12 22.3	+ 90
20	322 20.9	161 40.5	51.1	336 24.8	53.5	150 47.3	45.4	83 48.8	30.2	8 31.3	145	12 13.3	+ 89
21	337 23.4	176 40.2	·· 50.2	351 27.2	·· 53.2	165 49.3	·· 45.3	98 51.0	·· 30.3	23 04.8	145	·12 04.4	+ 91
22	352 25.9	191 39.9	49.2	6 29.7	53.0	180 51.3	45.1	113 53.2	30.3	37 38.3	146	11 55.3	+ 91
23	7 28.3	206 39.6	48.3	21 32.1	52.8	195 53.3	44.9	128 55.4	30.4	52 11.9	146	11 46.2	+ 91
14 00	22 30.8	221 39.3	+ 8 47.3	36 34.5	− 9 52.5	210 55.3	+ 4 44.7	143 57.6	−18 30.5	66 45.5	146	−11 37.1	+ 92
01	37 33.3	236 38.9	46.4	51 37.0	52.3	225 57.3	44.5	158 59.8	30.5	81 19.1	146	11 27.9	+ 92
02	52 35.7	251 38.6	45.5	66 39.4	52.1	240 59.3	44.3	174 02.0	30.6	95 52.7	147	11 18.7	+ 93
03	67 38.2	266 38.3	·· 44.5	81 41.8	·· 51.9	256 01.3	·· 44.1	189 04.2	·· 30.6	110 26.4	147	·11 09.4	+ 94
04	82 40.7	281 38.0	43.6	96 44.2	51.6	271 03.3	43.9	204 06.5	30.7	125 00.1	147	11 00.0	+ 94
05	97 43.1	296 37.7	42.6	111 46.7	51.4	286 05.3	43.7	219 08.7	30.7	139 33.8	147	10 50.6	+ 94
06	112 45.6	311 37.4	+ 8 41.7	126 49.1	− 9 51.2	301 07.3	+ 4 43.5	234 10.9	−18 30.8	154 07.5	147	−10 41.2	+ 95
07	127 48.0	326 37.1	40.7	141 51.5	50.9	316 09.3	43.3	249 13.1	30.9	168 41.2	148	10 31.7	+ 95
08	142 50.5	341 36.8	39.8	156 53.9	50.7	331 11.3	43.1	264 15.3	30.9	183 15.0	147	10 22.2	+ 96
09	157 53.0	356 36.5	·· 38.8	171 56.4	·· 50.5	346 13.3	·· 42.9	279 17.5	·· 31.0	197 48.7	148	·10 12.6	+ 96
10	172 55.4	11 36.2	37.8	186 58.8	50.2	1 15.3	42.7	294 19.7	31.0	212 22.5	148	10 03.0	+ 97
11	187 57.9	26 35.9	36.9	202 01.2	50.0	16 17.3	42.6	309 21.9	31.1	226 56.3	148	9 53.3	+ 97
12	203 00.4	41 35.6	+ 8 35.9	217 03.6	− 9 49.8	31 19.3	+ 4 42.4	324 24.1	−18 31.2	241 30.1	149	− 9 43.6	+ 97
13	218 02.8	56 35.3	35.0	232 06.0	49.5	46 21.3	42.2	339 26.3	31.2	256 04.0	148	9 33.9	+ 99
14	233 05.3	71 35.0	34.0	247 08.4	49.3	61 23.3	42.0	354 28.5	31.3	270 37.8	149	9 24.0	+ 98
15	248 07.8	86 34.7	·· 33.1	262 10.8	·· 49.0	76 25.3	·· 41.8	9 30.7	·· 31.3	285 11.7	148	· 9 14.2	+ 99
16	263 10.2	101 34.4	32.1	277 13.3	48.8	91 27.3	41.6	24 32.9	31.4	299 45.5	149	9 04.3	+ 99
17	278 12.7	116 34.1	31.2	292 15.7	48.6	106 29.3	41.4	39 35.1	31.4	314 19.4	149	8 54.4	+100
18	293 15.2	131 33.8	+ 8 30.2	307 18.1	− 9 48.3	121 31.3	+ 4 41.2	54 37.3	−18 31.5	328 53.3	149	− 8 44.4	+100
19	308 17.6	146 33.5	29.2	322 20.5	48.1	136 33.3	41.0	69 39.6	31.6	343 27.2	149	8 34.4	+100
20	323 20.1	161 33.2	28.3	337 22.9	47.9	151 35.3	40.8	84 41.8	31.6	358 01.1	150	8 24.4	+101
21	338 22.5	176 32.9	·· 27.3	352 25.3	·· 47.6	166 37.3	·· 40.6	99 44.0	·· 31.7	12 35.1	149	· 8 14.3	+102
22	353 25.0	191 32.6	26.4	7 27.7	47.4	181 39.3	40.4	114 46.2	31.7	27 09.0	149	8 04.1	+101
23	8 27.5	206 32.2	25.4	22 30.1	47.1	196 41.3	40.2	129 48.4	31.8	41 42.9	150	7 54.0	+102
24	23 29.9	221 31.9	+ 8 24.5	37 32.5	− 9 46.9	211 43.3	+ 4 40.1	144 50.6	−18 31.9	56 16.9	149	− 7 43.8	+103
code	—	− 3	− 10	+ 24	+ 3	+ 20	− 2	+ 22	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
12 0	183 20.7	− 7 18.4
1	198 20.9	19.3
2	213 21.1	20.3
3	228 21.2	21.2
4	243 21.4	22.1
5	258 21.5	23.1
6	273 21.7	− 7 24.0
7	288 21.8	25.0
8	303 22.0	25.9
9	318 22.1	26.8
10	333 22.3	27.8
11	348 22.5	28.7
12	3 22.6	− 7 29.6
13	18 22.8	30.6
14	33 22.9	31.5
15	48 23.1	32.5
16	63 23.2	33.4
17	78 23.4	34.3
18	93 23.5	− 7 35.3
19	108 23.7	36.2
20	123 23.8	37.1
21	138 24.0	38.1
22	153 24.1	39.0
23	168 24.3	40.0
13 0	183 24.4	− 7 40.9
1	198 24.6	41.8
2	213 24.7	42.8
3	228 24.9	43.7
4	243 25.0	44.6
5	258 25.2	45.6
6	273 25.3	− 7 46.5
7	288 25.5	47.4
8	303 25.6	48.4
9	318 25.8	49.3
10	333 25.9	50.2
11	348 26.1	51.2
12	3 26.2	− 7 52.1
13	18 26.4	53.0
14	33 26.5	54.0
15	48 26.7	54.9
16	63 26.8	55.8
17	78 27.0	56.8
18	93 27.1	− 7 57.7
19	108 27.3	58.6
20	123 27.4	7 59.6
21	138 27.6	8 00.5
22	153 27.7	01.4
23	168 27.9	02.4
14 0	183 28.0	− 8 03.3
1	198 28.2	04.2
2	213 28.3	05.2
3	228 28.4	06.1
4	243 28.6	07.0
5	258 28.7	08.0
6	273 28.9	− 8 08.9
7	288 29.0	09.8
8	303 29.2	10.7
9	318 29.3	11.7
10	333 29.5	12.6
11	348 29.6	13.5
12	3 29.7	− 8 14.5
13	18 29.9	15.4
14	33 30.0	16.3
15	48 30.2	17.3
16	63 30.3	18.2
17	78 30.5	19.1
18	93 30.6	− 8 20.0
19	108 30.7	21.0
20	123 30.9	21.9
21	138 31.0	22.8
22	153 31.2	23.7
23	168 31.3	24.7
24	183 31.4	− 8 25.6
code	—	− 9

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 50.2	−40 28.4
5	Achernar	335 57.7	−57 27.2
30	Acrux	173 57.6	−62 51.5
19	Adhara	255 45.9	−28 54.5
10	Aldebaran	291 38.0	+16 25.5
32	Alioth	166 58.5	+56 11.6
34	Alkaid	153 32.8	+49 31.8
55	Al Na'ir	28 36.7	−47 10.2
15	Alnilam	276 29.4	− 1 13.6
25	Alphard	218 38.0	− 8 28.2
41	Alphecca	126 47.3	+26 51.7
1	Alpheratz	358 27.2	+28 51.4
51	Altair	62 49.7	+ 8 45.5
2	Ankaa	353 57.1	−42 32.3
42	Antares	113 18.7	−26 20.2
37	Arcturus	146 34.8	+19 24.5
43	Atria	108 59.0	−68 57.2
22	Avior	234 35.6	−59 22.0
13	Bellatrix	279 17.4	+ 6 18.8
16	Betelg'se	271 47.2	+ 7 24.1
17	Canopus	264 14.9	−52 40.0
12	Capella	281 37.0	+45 57.2
53	Deneb	50 00.3	+45 07.9
28	Denebola	183 17.3	+14 48.8
4	Diphda	349 38.2	−18 13.2
27	Dubhe	194 44.3	+61 58.9
14	Elnath	279 06.2	+28 34.3
47	Eltanin	91 06.1	+51 30.0
54	Enif	34 28.7	+ 9 40.8
56	Fomalhaut	16 10.5	−29 51.0
31	Gacrux	172 48.9	−56 52.2
29	Gienah	176 36.4	−17 18.1
35	Hadar	149 48.9	−60 10.0
6	Hamal	328 48.4	+23 15.7
48	Kaus Aust.	84 40.3	−34 24.4
40	Kochab	137 19.2	+74 20.1
57	Markab	14 20.4	+14 58.6
8	Menkar	314 59.2	+ 3 55.4
36	Menkent	148 58.1	−36 09.5
24	Miapl'dus	221 49.2	−69 32.1
9	Mirfak	309 40.8	+49 42.5
50	Nunki	76 51.0	−26 21.1
52	Peacock	54 26.0	−56 52.6
21	Pollux	244 19.7	+28 07.8
20	Procyon	245 44.2	+ 5 20.2
46	R'alhague	96 46.1	+12 35.6
26	Regulus	208 28.9	+12 10.7
11	Rigel	281 52.7	− 8 14.9
38	Rigil Kent.	140 50.5	−60 39.6
44	Sabik	103 01.5	−15 40.3
3	Schedar	350 28.5	+56 18.2
45	Shaula	97 19.8	−37 04.5
18	Sirius	259 11.1	−16 39.2
33	Spica	159 16.4	−10 56.1
23	Suhail	223 23.9	−43 15.3
49	Vega	81 07.8	+38 44.9
39	Zub'g'bi	137 52.8	−15 51.7

GMT	Equation of Time (App.− Mean) 12	13	14
h	m s	m s	m s
0	+13 22.7	+13 37.5	+13 51.7
6	+13 26.4	+13 41.1	+13 55.2
12	+13 30.1	+13 44.7	+13 58.7
18	+13 33.8	+13 48.2	+14 02.1
24	+13 37.5	+13 51.7	+14 05.5

Lat. N °	Sunrise h m	Twlt. begins h m	Moonrise 12 h m	13 h m	14 h m	15 h m
72	7 14	3 18	16 46	16 18	16 00	15 46
70	7 04	3 33	16 06	15 55	15 46	15 39
68	6 56	3 45	15 39	15 37	15 35	15 33
66	6 49	3 54	15 17	15 23	15 26	15 28
64	6 44	4 02	15 01	15 11	15 18	15 24
62	6 39	4 08	14 47	15 01	15 11	15 21
60	6 34	4 13	14 35	14 52	15 06	15 17
58	6 30	4 17	14 25	14 44	15 00	15 15
56	6 27	4 21	14 16	14 37	14 56	15 12
54	6 24	4 24	14 08	14 31	14 52	15 10
52	6 21	4 27	14 00	14 26	14 48	15 08
50	6 19	4 30	13 54	14 21	14 44	15 06
45	6 13	4 35	13 40	14 10	14 37	15 02
40	6 08	4 37	13 29	14 01	14 31	14 59
35	6 04	4 39	13 19	13 53	14 25	14 56
30	6 00	4 41	13 10	13 46	14 20	14 53
20	5 54	4 41	12 55	13 35	14 12	14 49
10	5 48	4 38	12 42	13 24	14 05	14 45
0	5 43	4 34	12 30	13 14	13 58	14 41
10	5 37	4 27	12 17	13 05	13 51	14 37
20	5 31	4 17	12 04	12 54	13 44	14 33
30	5 24	4 03	11 49	12 42	13 35	14 28
35	5 20	3 53	11 40	12 35	13 30	14 26
40	5 16	3 42	11 30	12 27	13 25	14 23
45	5 10	3 27	11 19	12 18	13 18	14 19
50	5 03	3 07	11 04	12 07	13 10	14 15
52	5 00	2 57	10 57	12 01	13 07	14 13
54	4 57	2 45	10 50	11 56	13 03	14 11
56	4 53	2 31	10 42	11 49	12 59	14 09
58	4 49	2 14	10 32	11 42	12 54	14 06
60	4 45	1 52	10 21	11 34	12 48	14 03

Lat. N °	Sunset h m	Twlt. ends h m	Moonset 12 h m	13 h m	14 h m	15 h m
72	16 16	20 07	20 50	22 49	24 37	0 37
70	16 26	19 53	21 28	23 11	24 49	0 49
68	16 35	19 43	21 55	23 27	24 59	0 59
66	16 42	19 34	22 15	23 41	25 07	1 07
64	16 47	19 26	22 31	23 52	25 13	1 13
62	16 53	19 21	22 44	24 01	0 01	1 19
60	16 57	19 16	22 56	24 09	0 09	1 24
58	17 01	19 12	23 05	24 16	0 16	1 28
56	17 04	19 08	23 14	24 22	0 22	1 32
54	17 08	19 06	23 21	24 28	0 28	1 36
52	17 10	19 02	23 28	24 33	0 33	1 39
50	17 13	19 00	23 34	24 37	0 37	1 41
45	17 19	18 56	23 47	24 47	0 47	1 48
40	17 24	18 54	23 58	24 55	0 55	1 53
35	17 28	18 52	24 07	0 07	1 02	1 57
30	17 32	18 52	24 15	0 15	1 08	2 01
20	17 38	18 51	24 28	0 28	1 18	2 07
10	17 44	18 54	24 40	0 40	1 27	2 13
0	17 50	18 59	0 06	0 51	1 35	2 19
10	17 55	19 06	0 19	1 02	1 44	2 24
20	18 01	19 16	0 34	1 14	1 53	2 30
30	18 09	19 31	0 50	1 28	2 03	2 36
35	18 13	19 41	0 59	1 35	2 08	2 40
40	18 18	19 53	1 10	1 44	2 15	2 44
45	18 23	20 08	1 22	1 54	2 22	2 48
50	18 30	20 29	1 38	2 07	2 32	2 54
52	18 33	20 40	1 45	2 12	2 36	2 57
54	18 37	20 52	1 53	2 18	2 40	3 00
56	18 40	21 06	2 01	2 25	2 45	3 03
58	18 45	21 25	2 11	2 33	2 51	3 06
60	18 49	21 47	2 23	2 42	2 57	3 10

GMT of Transit
Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
12	18 41	9 13	21 38	10 01	14 29
13	19 25	9 13	21 34	9 58	14 26
14	20 08	9 14	21 30	9 55	14 22
15	20 51	9 14	21 26	9 52	14 19

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.4	0.1	0.3
30	0.4	0.1	0.2
45	0.4	0.1	0.2
60	0.4	0.1	0.1
75	0.4	0.1	0.1
90	0.4	0.0	0.0

Moon's Lower Limb Add

Alt.	12	13	14
°	′	′	′
0	12.0	12.1	12.2
4	12.0	12.1	12.3
8	12.0	12.2	12.3
12	12.1	12.2	12.3
16	12.1	12.2	12.4
20	12.2	12.3	12.4
24	12.3	12.4	12.5
28	12.4	12.5	12.6
32	12.5	12.6	12.7
36	12.6	12.7	12.8
40	12.7	12.8	12.9
44	12.8	12.9	13.0
48	13.0	13.1	13.2
52	13.1	13.2	13.3
56	13.3	13.4	13.5
60	13.5	13.5	13.6
64	13.6	13.7	13.8
68	13.8	13.9	14.0
72	14.0	14.1	14.1
76	14.2	14.3	14.3
80	14.4	14.4	14.5
84	14.6	14.6	14.7
88	14.7	14.8	14.8
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	12	13	14
°	′	′	′
0	17.6	17.5	17.4
4	17.6	17.5	17.4
8	17.5	17.5	17.4
12	17.5	17.4	17.4
16	17.5	17.4	17.3
20	17.4	17.3	17.3
24	17.3	17.2	17.2
28	17.2	17.2	17.1
32	17.1	17.1	17.0
36	17.0	16.9	16.9
40	16.9	16.8	16.8
44	16.7	16.7	16.6
48	16.6	16.6	16.5
52	16.4	16.4	16.4
56	16.3	16.2	16.2
60	16.1	16.1	16.1
64	15.9	15.9	15.9
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.2
84	15.0	15.0	15.0
88	14.8	14.9	14.9
90			

Subtract from table, back cover

Columbus Day 12

GMT	♈ GHA	VENUS — 3.6 GHA	Dec.	MARS — 1.8 GHA	Dec.	JUPITER — 1.3 GHA	Dec.	SATURN 0.8 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
15 00	23 29.9	221 31.9	+ 8 24.5	37 32.5	− 9 46.9	211 43.3	+ 4 40.1	144 50.6	−18 31.9	56 16.9	149	− 7 43.8	+103
01	38 32.4	236 31.6	23.5	52 34.9	46.7	226 45.3	39.9	159 52.8	31.9	70 50.8	150	7 33.5	+102
02	53 34.9	251 31.3	22.5	67 37.3	46.4	241 47.3	39.7	174 55.0	32.0	85 24.8	150	7 23.3	+104
03	68 37.3	266 31.0	·· 21.6	82 39.7	·· 46.2	256 49.3	·· 39.5	189 57.2	·· 32.0	99 58.8	149	· 7 12.9	+103
04	83 39.8	281 30.7	20.6	97 42.1	45.9	271 51.3	39.3	204 59.4	32.1	114 32.7	150	7 02.6	+104
05	98 42.3	296 30.4	19.6	112 44.5	45.7	286 53.3	39.1	220 01.6	32.1	129 06.7	150	6 52.2	+104
06	113 44.7	311 30.1	+ 8 18.7	127 46.9	− 9 45.4	301 55.3	+ 4 38.9	235 03.8	−18 32.2	143 40.7	150	− 6 41.8	+105
07	128 47.2	326 29.8	17.7	142 49.3	45.2	316 57.3	38.7	250 06.0	32.3	158 14.7	149	6 31.3	+104
08	143 49.7	341 29.5	16.8	157 51.7	44.9	331 59.3	38.5	265 08.2	32.3	172 48.6	150	6 20.9	+106
09	158 52.1	356 29.2	·· 15.8	172 54.0	·· 44.7	347 01.3	·· 38.3	280 10.4	·· 32.4	187 22.6	150	· 6 10.3	+105
10	173 54.6	11 28.9	14.8	187 56.4	44.5	2 03.3	38.1	295 12.6	32.4	201 56.6	150	5 59.8	+106
11	188 57.0	26 28.6	13.9	202 58.8	44.2	17 05.3	37.9	310 14.8	32.5	216 30.6	150	5 49.2	+106
12	203 59.5	41 28.3	+ 8 12.9	218 01.2	− 9 44.0	32 07.3	+ 4 37.7	325 17.0	−18 32.6	231 04.6	149	− 5 38.6	+106
13	219 02.0	56 28.0	11.9	233 03.6	43.7	47 09.3	37.6	340 19.2	32.6	245 38.5	150	5 28.0	+107
14	234 04.4	71 27.7	11.0	248 06.0	43.5	62 11.3	37.4	355 21.4	32.7	260 12.5	150	5 17.3	+107
15	249 06.9	86 27.4	·· 10.0	263 08.3	·· 43.2	77 13.3	·· 37.2	10 23.6	·· 32.7	274 46.5	150	· 5 06.6	+107
16	264 09.4	101 27.1	09.0	278 10.7	43.0	92 15.3	37.0	25 25.9	32.8	289 20.5	149	4 55.9	+108
17	279 11.8	116 26.8	08.1	293 13.1	42.7	107 17.3	36.8	40 28.1	32.8	303 54.4	150	4 45.1	+108
18	294 14.3	131 26.5	+ 8 07.1	308 15.5	− 9 42.5	122 19.3	+ 4 36.6	55 30.3	−18 32.9	318 28.4	149	− 4 34.3	+108
19	309 16.8	146 26.2	06.1	323 17.9	42.2	137 21.3	36.4	70 32.5	33.0	333 02.3	150	4 23.5	+108
20	324 19.2	161 25.9	05.1	338 20.2	42.0	152 23.3	36.2	85 34.7	33.0	347 36.3	149	4 12.7	+109
21	339 21.7	176 25.6	·· 04.2	353 22.6	·· 41.7	167 25.3	·· 36.0	100 36.9	·· 33.1	2 10.2	150	· 4 01.8	+109
22	354 24.1	191 25.3	03.2	8 25.0	41.5	182 27.3	35.8	115 39.1	33.1	16 44.2	149	3 50.9	+109
23	9 26.6	206 25.0	02.2	23 27.3	41.2	197 29.3	35.6	130 41.3	33.2	31 18.1	149	3 40.0	+109
16 00	24 29.1	221 24.7	+ 8 01.3	38 29.7	− 9 41.0	212 31.3	+ 4 35.5	145 43.5	−18 33.3	45 52.0	149	− 3 29.1	+110
01	39 31.5	236 24.3	8 00.3	53 32.1	40.7	227 33.3	35.3	160 45.7	33.3	60 25.9	149	3 18.1	+109
02	54 34.0	251 24.0	7 59.3	68 34.5	40.5	242 35.3	35.1	175 47.9	33.4	74 59.8	149	3 07.2	+110
03	69 36.5	266 23.7	·· 58.3	83 36.8	·· 40.2	257 37.3	·· 34.9	190 50.1	·· 33.4	89 33.7	148	· 2 56.2	+111
04	84 38.9	281 23.4	57.4	98 39.2	40.0	272 39.3	34.7	205 52.3	33.5	104 07.5	149	2 45.1	+110
05	99 41.4	296 23.1	56.4	113 41.5	39.7	287 41.4	34.5	220 54.5	33.5	118 41.4	148	2 34.1	+110
06	114 43.9	311 22.8	+ 7 55.4	128 43.9	− 9 39.5	302 43.4	+ 4 34.3	235 56.7	−18 33.6	133 15.2	148	− 2 23.1	+111
07	129 46.3	326 22.5	54.4	143 46.3	39.2	317 45.4	34.1	250 58.9	33.7	147 49.0	148	2 12.0	+111
08	144 48.8	341 22.2	53.5	158 48.6	38.9	332 47.4	33.9	266 01.1	33.7	162 22.8	148	2 00.9	+111
09	159 51.3	356 21.9	·· 52.5	173 51.0	·· 38.7	347 49.4	·· 33.7	281 03.3	·· 33.8	176 56.6	148	· 1 49.8	+112
10	174 53.7	11 21.6	51.5	188 53.3	38.4	2 51.4	33.5	296 05.5	33.8	191 30.4	147	1 38.6	+111
11	189 56.2	26 21.3	50.5	203 55.7	38.2	17 53.4	33.3	311 07.7	33.9	206 04.1	148	1 27.5	+112
12	204 58.6	41 21.0	+ 7 49.6	218 58.1	− 9 37.9	32 55.4	+ 4 33.2	326 09.9	−18 34.0	220 37.9	147	− 1 16.3	+111
13	220 01.1	56 20.7	48.6	234 00.4	37.7	47 57.4	33.0	341 12.1	34.0	235 11.6	147	1 05.2	+112
14	235 03.6	71 20.4	47.6	249 02.8	37.4	62 59.4	32.8	356 14.3	34.1	249 45.3	147	0 54.0	+112
15	250 06.0	86 20.1	·· 46.6	264 05.1	·· 37.1	78 01.4	·· 32.6	11 16.5	·· 34.1	264 19.0	146	· 0 42.8	+112
16	265 08.5	101 19.8	45.6	279 07.5	36.9	93 03.4	32.4	26 18.7	34.2	278 52.6	146	0 31.6	+112
17	280 11.0	116 19.5	44.7	294 09.8	36.6	108 05.4	32.2	41 20.9	34.2	293 26.2	146	0 20.4	+113
18	295 13.4	131 19.2	+ 7 43.7	309 12.2	− 9 36.4	123 07.4	+ 4 32.0	56 23.1	−18 34.3	307 59.8	146	− 0 09.1	+112
19	310 15.9	146 18.9	42.7	324 14.5	36.1	138 09.4	31.8	71 25.3	34.4	322 33.4	146	+ 0 02.1	+113
20	325 18.4	161 18.6	41.7	339 16.8	35.8	153 11.4	31.6	86 27.5	34.4	337 07.0	145	0 13.4	+112
21	340 20.8	176 18.3	·· 40.7	354 19.2	·· 35.6	168 13.4	·· 31.4	101 29.7	·· 34.5	351 40.5	145	· 0 24.6	+113
22	355 23.3	191 18.0	39.7	9 21.5	35.3	183 15.4	31.2	116 31.9	34.5	6 14.0	145	0 35.9	+113
23	10 25.7	206 17.7	38.8	24 23.9	35.0	198 17.4	31.1	131 34.1	34.6	20 47.5	144	0 47.2	+112
17 00	25 28.2	221 17.4	+ 7 37.8	39 26.2	− 9 34.8	213 19.4	+ 4 30.9	146 36.3	−18 34.7	35 20.9	145	+ 0 58.4	+113
01	40 30.7	236 17.1	36.8	54 28.5	34.5	228 21.4	30.7	161 38.5	34.7	49 54.4	144	1 09.7	+113
02	55 33.1	251 16.8	35.8	69 30.9	34.3	243 23.4	30.5	176 40.7	34.8	64 27.8	143	1 21.0	+113
03	70 35.6	266 16.5	·· 34.8	84 33.2	·· 34.0	258 25.5	·· 30.3	191 42.9	·· 34.8	79 01.1	143	· 1 32.3	+113
04	85 38.1	281 16.2	33.8	99 35.5	33.7	273 27.5	30.1	206 45.1	34.9	93 34.4	143	1 43.6	+113
05	100 40.5	296 15.9	32.8	114 37.9	33.5	288 29.5	29.9	221 47.3	35.0	108 07.7	143	1 54.9	+113
06	115 43.0	311 15.6	+ 7 31.9	129 40.2	− 9 33.2	303 31.5	+ 4 29.7	236 49.5	−18 35.0	122 41.0	142	+ 2 06.2	+113
07	130 45.5	326 15.3	30.9	144 42.5	32.9	318 33.5	29.5	251 51.7	35.1	137 14.2	142	2 17.5	+113
08	145 47.9	341 15.0	29.9	159 44.9	32.7	333 35.5	29.3	266 53.9	35.1	151 47.4	142	2 28.8	+113
09	160 50.4	356 14.6	·· 28.9	174 47.2	·· 32.4	348 37.5	·· 29.2	281 56.1	·· 35.2	166 20.6	141	· 2 40.1	+113
10	175 52.9	11 14.3	27.9	189 49.5	32.1	3 39.5	29.0	296 58.3	35.2	180 53.7	141	2 51.4	+113
11	190 55.3	26 14.0	26.9	204 51.8	31.9	18 41.5	28.8	312 00.5	35.3	195 26.8	141	3 02.7	+113
12	205 57.8	41 13.7	+ 7 25.9	219 54.2	− 9 31.6	33 43.5	+ 4 28.6	327 02.7	−18 35.4	209 59.9	140	+ 3 14.0	+113
13	221 00.2	56 13.4	24.9	234 56.5	31.3	48 45.5	28.4	342 04.9	35.4	224 32.9	140	3 25.3	+113
14	236 02.7	71 13.1	23.9	249 58.8	31.1	63 47.5	28.2	357 07.1	35.5	239 05.9	139	3 36.6	+113
15	251 05.2	86 12.8	·· 22.9	265 01.1	·· 30.8	78 49.5	·· 28.0	12 09.3	·· 35.5	253 38.8	139	· 3 47.9	+112
16	266 07.6	101 12.5	22.0	280 03.5	30.5	93 51.5	27.8	27 11.5	35.6	268 11.7	139	3 59.1	+113
17	281 10.1	116 12.2	21.0	295 05.8	30.2	108 53.5	27.6	42 13.7	35.7	282 44.6	138	4 10.4	+113
18	296 12.6	131 11.9	+ 7 20.0	310 08.1	− 9 30.0	123 55.5	+ 4 27.4	57 15.9	−18 35.7	297 17.4	138	+ 4 21.7	+112
19	311 15.0	146 11.6	19.0	325 10.4	29.7	138 57.6	27.3	72 18.1	35.8	311 50.2	137	4 32.9	+112
20	326 17.5	161 11.3	18.0	340 12.7	29.4	153 59.6	27.1	87 20.3	35.8	326 22.9	137	4 44.1	+113
21	341 20.0	176 11.0	·· 17.0	355 15.0	·· 29.2	169 01.6	·· 26.9	102 22.5	·· 35.9	340 55.6	136	· 4 55.4	+112
22	356 22.4	191 10.7	16.0	10 17.3	28.9	184 03.6	26.7	117 24.7	35.9	355 28.2	136	5 06.6	+112
23	11 24.9	206 10.4	15.0	25 19.7	28.6	199 05.6	26.5	132 26.9	36.0	10 00.8	136	5 17.8	+112
24	26 27.4	221 10.1	+ 7 14.0	40 22.0	− 9 28.3	214 07.6	+ 4 26.3	147 29.1	−18 36.1	24 33.4	135	+ 5 29.0	+111
code	—	− 3	− 10	+ 23	+ 2	+ 20	− 2	+ 22	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
15 0	183 31.4	− 8 25.6	7	Acamar	315 50.2	−40 28.4
1	198 31.6	26.5	5	Achernar	335 57.7	−57 27.2
2	213 31.7	27.5	30	Acrux	173 57.5	−62 51.5
3	228 31.9	28.4	19	Adhara	255 45.9	−28 54.6
4	243 32.0	29.3	10	Aldebaran	291 37.9	+16 25.5
5	258 32.1	30.2				
6	273 32.3	− 8 31.2	32	Alioth	166 58.5	+56 11.6
7	288 32.4	32.1	34	Alkaid	153 32.8	+49 31.7
8	303 32.6	33.0	55	Al Na'ir	28 36.7	−47 10.3
9	318 32.7	33.9	15	Alnilam	276 29.3	− 1 13.6
10	333 32.8	34.9	25	Alphard	218 38.0	− 8 28.2
11	348 33.0	35.8				
12	3 33.1	− 8 36.7	41	Alphecca	126 47.3	+26 51.7
13	18 33.2	37.6	1	Alpheratz	358 27.2	+28 51.4
14	33 33.4	38.6	51	Altair	62 49.7	+ 8 45.5
15	48 33.5	39.5	2	Ankaa	353 57.1	−42 32.3
16	63 33.7	40.4	42	Antares	113 18.7	−26 20.2
17	78 33.8	41.3				
18	93 33.9	− 8 42.2	37	Arcturus	146 34.8	+19 24.5
19	108 34.1	43.2	43	Atria	108 59.1	−68 57.2
20	123 34.2	44.1	22	Avior	234 35.5	−59 22.0
21	138 34.3	45.0	13	Bellatrix	279 17.4	+ 6 18.8
22	153 34.5	45.9	16	Betelg'se	271 47.2	+ 7 24.1
23	168 34.6	46.9				
			17	Canopus	264 14.9	−52 40.0
16 0	183 34.7	− 8 47.8	12	Capella	281 37.0	+45 57.2
1	198 34.9	48.7	53	Deneb	50 00.3	+45 07.9
2	213 35.0	49.6	28	Denebola	183 17.2	+14 48.8
3	228 35.1	50.5	4	Diphda	349 38.2	−18 13.2
4	243 35.3	51.5				
5	258 35.4	52.4	27	Dubhe	194 44.2	+61 58.9
6	273 35.5	− 8 53.3	14	Elnath	279 06.2	+28 34.3
7	288 35.7	54.2	47	Eltanin	91 06.1	+51 30.0
8	303 35.8	55.1	54	Enif	34 28.7	+ 9 40.9
9	318 35.9	56.1	56	Fomalhaut	16 10.5	−29 51.0
10	333 36.1	57.0				
11	348 36.2	57.9	31	Gacrux	172 48.9	−56 52.2
12	3 36.3	− 8 58.8	29	Gienah	176 36.4	−17 18.1
13	18 36.5	8 59.7	35	Hadar	149 48.9	−60 09.9
14	33 36.6	9 00.7	6	Hamal	328 48.4	+23 15.7
15	48 36.7	01.6	48	Kaus Aust.	84 40.3	−34 24.4
16	63 36.9	02.5				
17	78 37.0	03.4	40	Kochab	137 19.2	+74 20.0
18	93 37.1	− 9 04.3	57	Markab	14 20.4	+14 58.6
19	108 37.3	05.2	8	Menkar	314 59.2	+ 3 55.4
20	123 37.4	06.2	36	Menkent	148 58.1	−36 09.5
21	138 37.5	07.1	24	Miapl'dus	221 49.1	−69 32.1
22	153 37.7	08.0				
23	168 37.8	08.9	9	Mirfak	309 40.8	+49 42.5
			50	Nunki	76 51.0	−26 21.1
17 0	183 37.9	− 9 09.8	52	Peacock	54 26.0	−56 52.6
1	198 38.0	10.7	21	Pollux	244 19.7	+28 07.8
2	213 38.2	11.7	20	Procyon	245 44.2	+ 5 20.2
3	228 38.3	12.6				
4	243 38.4	13.5	46	R'alhague	96 46.1	+12 35.6
5	258 38.5	14.4	26	Regulus	208 28.9	+12 10.7
6	273 38.7	− 9 15.3	11	Rigel	281 52.7	− 8 14.9
7	288 38.8	16.2	38	Rigil Kent.	140 50.5	−60 39.5
8	303 38.9	17.2	44	Sabik	103 01.5	−15 40.3
9	318 39.1	18.1				
10	333 39.2	19.0	3	Schedar	350 28.5	+56 18.3
11	348 39.3	19.9	45	Shaula	97 19.9	−37 04.5
12	3 39.4	− 9 20.8	18	Sirius	259 11.1	−16 39.2
13	18 39.6	21.7	33	Spica	159 16.4	−10 56.1
14	33 39.7	22.6	23	Suhail	223 23.9	−43 15.3
15	48 39.8	23.5				
16	63 39.9	24.5	49	Vega	81 07.9	+38 44.9
17	78 40.1	25.4	39	Zub'g'bi	137 52.8	−15 51.7
18	93 40.2	− 9 26.3				
19	108 40.3	27.2				
20	123 40.4	28.1				
21	138 40.6	29.0				
22	153 40.7	29.9				
23	168 40.8	30.8				
24	183 40.9	− 9 31.8				
code	—	− 9				

Lat. N °	Sunrise h m	Twlt. begins h m
72	7 29	3 34
70	7 17	3 47
68	7 08	3 57
66	6 59	4 04
64	6 53	4 11
62	6 47	4 16
60	6 42	4 20
58	6 37	4 24
56	6 33	4 27
54	6 30	4 30
52	6 26	4 33
50	6 23	4 35
45	6 17	4 38
40	6 11	4 40
35	6 07	4 42
30	6 02	4 42
20	5 55	4 41
10	5 49	4 39
0	5 42	4 32
10	5 36	4 25
20	5 29	4 15
30	5 21	3 59
35	5 16	3 50
40	5 11	3 37
45	5 05	3 21
50	4 57	2 58
52	4 54	2 48
54	4 50	2 34
56	4 46	2 19
58	4 41	2 00
60	4 36	1 35
S		

Lat. N °	Sunset h m	Twlt. ends h m
72	16 00	19 50
70	16 12	19 38
68	16 22	19 29
66	16 30	19 22
64	16 37	19 16
62	16 43	19 11
60	16 48	19 07
58	16 53	19 04
56	16 57	19 01
54	17 01	18 59
52	17 04	18 56
50	17 07	18 54
45	17 14	18 52
40	17 19	18 49
35	17 24	18 48
30	17 28	18 48
20	17 36	18 50
10	17 43	18 53
0	17 49	18 59
10	17 55	19 06
20	18 02	19 17
30	18 11	19 34
35	18 15	19 44
40	18 21	19 57
45	18 27	20 14
50	18 35	20 36
52	18 38	20 47
54	18 42	21 01
56	18 47	21 18
58	18 51	21 37
60	18 57	22 05
S		

Moonrise Lat. N °	15 h m	16 h m	17 h m	18 h m
72	15 46	15 33	15 20	15 05
70	15 39	15 32	15 25	15 17
68	15 33	15 31	15 29	15 27
66	15 28	15 30	15 32	15 35
64	15 24	15 30	15 35	15 42
62	15 21	15 29	15 38	15 48
60	15 17	15 29	15 40	15 53
58	15 15	15 28	15 42	15 58
56	15 12	15 28	15 44	16 02
54	15 10	15 28	15 46	16 05
52	15 08	15 27	15 47	16 09
50	15 06	15 27	15 49	16 12
45	15 02	15 27	15 52	16 18
40	14 59	15 26	15 54	16 24
35	14 56	15 26	15 57	16 29
30	14 53	15 25	15 58	16 33
20	14 49	15 25	16 02	16 41
10	14 45	15 24	16 05	16 47
0	14 41	15 24	16 08	16 54
10	14 37	15 23	16 11	17 00
20	14 33	15 23	16 14	17 07
30	14 28	15 22	16 18	17 15
35	14 26	15 22	16 20	17 19
40	14 23	15 22	16 22	17 24
45	14 19	15 21	16 25	17 30
50	14 15	15 21	16 28	17 37
52	14 13	15 21	16 30	17 41
54	14 11	15 21	16 32	17 45
56	14 09	15 20	16 33	17 49
58	14 06	15 20	16 36	17 53
60	14 03	15 20	16 38	17 58

Moonset Lat. N °	15 h m	16 h m	17 h m	18 h m
72	0 37	2 22	4 06	5 54
70	0 49	2 26	4 04	5 44
68	0 59	2 30	4 02	5 37
66	1 07	2 33	4 00	5 30
64	1 13	2 35	3 59	5 25
62	1 19	2 38	3 58	5 20
60	1 24	2 40	3 57	5 16
58	1 28	2 41	3 56	5 12
56	1 32	2 43	3 55	5 09
54	1 36	2 44	3 54	5 06
52	1 39	2 45	3 54	5 03
50	1 41	2 46	3 53	5 01
45	1 48	2 49	3 52	4 56
40	1 53	2 51	3 51	4 52
35	1 57	2 53	3 50	4 48
30	2 01	2 54	3 49	4 45
20	2 07	2 57	3 47	4 39
10	2 13	2 59	3 46	4 34
0	2 19	3 01	3 45	4 30
10	2 24	3 03	3 44	4 25
20	2 30	3 06	3 42	4 20
30	2 36	3 08	3 41	4 14
35	2 40	3 10	3 40	4 11
40	2 44	3 11	3 39	4 08
45	2 48	3 13	3 38	4 03
50	2 54	3 15	3 37	3 59
52	2 57	3 16	3 36	3 56
54	3 00	3 17	3 35	3 54
56	3 03	3 19	3 34	3 51
58	3 06	3 20	3 34	3 48
60	3 10	3 21	3 33	3 44

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.4	0.1	0.3
30	0.4	0.1	0.2
45	0.4	0.1	0.2
60	0.4	0.1	0.1
75	0.4	0.0	0.0
90			

Moon's Lower Limb Add

Alt. °	15 ′	16 ′	17 ′
0	12.6	13.3	13.9
4	12.6	13.3	13.9
8	12.7	13.3	13.9
12	12.7	13.3	13.9
16	12.7	13.3	14.0
20	12.8	13.4	14.0
24	12.9	13.4	14.0
28	12.9	13.5	14.1
32	13.0	13.6	14.1
36	13.1	13.6	14.2
40	13.2	13.7	14.2
44	13.3	13.8	14.3
48	13.4	13.9	14.4
52	13.6	14.0	14.4
56	13.7	14.1	14.5
60	13.8	14.2	14.6
64	14.0	14.3	14.7
68	14.1	14.4	14.8
72	14.3	14.6	14.8
76	14.4	14.7	14.9
80	14.6	14.8	15.0
84	14.8	14.9	15.1
88	14.9	15.0	15.2
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt. °	15 ′	16 ′	17 ′
0	17.2	16.9	16.5
4	17.2	16.8	16.5
8	17.2	16.8	16.5
12	17.2	16.8	16.5
16	17.1	16.8	16.4
20	17.1	16.7	16.4
24	17.0	16.7	16.4
28	16.9	16.6	16.3
32	16.8	16.6	16.3
36	16.7	16.5	16.2
40	16.6	16.4	16.2
44	16.5	16.3	16.1
48	16.4	16.2	16.0
52	16.3	16.1	16.0
56	16.1	16.0	15.9
60	16.0	15.9	15.8
64	15.9	15.8	15.7
68	15.7	15.7	15.6
72	15.6	15.6	15.6
76	15.4	15.4	15.5
80	15.2	15.3	15.4
84	15.1	15.2	15.3
88	15.0	15.1	15.2
90			

Subtract from table, back cover

GMT	Equation of Time (App.—Mean) 15 m s	16 m s	17 m s
h			
0	+14 05.5	+14 18.7	+14 31.4
6	+14 08.8	+14 21.9	+14 34.5
12	+14 12.2	+14 25.1	+14 37.5
18	+14 15.5	+14 28.3	+14 40.5
24	+14 18.7	+14 31.4	+14 43.5

GMT of Transit Meridian of Greenwich DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
15	20 51	9 14	21 26	9 52	14 19
16	21 34	9 15	21 23	9 49	14 15
17	22 19	9 15	21 19	9 45	14 12
18	23 05	9 16	21 15	9 42	14 08

G M T	♈ GHA	VENUS −3.6 GHA	Dec.	MARS −1.7 GHA	Dec.	JUPITER −1.3 GHA	Dec.	SATURN 0.8 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
18 0	26 27.4	221 10.1	+ 7 14.0	40 22.0	− 9 28.3	214 07.6	+ 4 26.3	147 29.1	−18 36.1	24 33.4	135	+ 5 29.0	+111
1	41 29.8	236 09.8	13.0	55 24.3	28.1	229 09.6	26.1	162 31.3	36.1	39 05.9	135	5 40.1	+112
2	56 32.3	251 09.5	12.0	70 26.6	27.8	244 11.6	25.9	177 33.5	36.2	53 38.4	134	5 51.3	+111
3	71 34.7	266 09.2	·· 11.0	85 28.9	·· 27.5	259 13.6	·· 25.7	192 35.7	·· 36.2	68 10.8	133	· 6 02.4	+112
4	86 37.2	281 08.9	10.0	100 31.2	27.2	274 15.6	25.6	207 37.9	36.3	82 43.1	134	6 13.6	+111
5	101 39.7	296 08.6	09.0	115 33.5	27.0	289 17.6	25.4	222 40.1	36.4	97 15.5	132	6 24.7	+110
6	116 42.1	311 08.3	+ 7 08.0	130 35.8	− 9 26.7	304 19.6	+ 4 25.2	237 42.3	−18 36.4	111 47.7	132	+ 6 35.7	+111
7	131 44.6	326 08.0	07.0	145 38.1	26.4	319 21.6	25.0	252 44.5	36.5	126 19.9	132	6 46.8	+111
8	146 47.1	341 07.7	06.0	160 40.4	26.1	334 23.7	24.8	267 46.7	36.5	140 52.1	131	6 57.9	+110
9	161 49.5	356 07.4	·· 05.0	175 42.7	·· 25.9	349 25.7	·· 24.6	282 48.9	·· 36.6	155 24.2	131	· 7 08.9	+110
10	176 52.0	11 07.1	04.0	190 45.0	25.6	4 27.7	24.4	297 51.1	36.7	169 56.3	130	7 19.9	+109
11	191 54.5	26 06.8	03.0	205 47.3	25.3	19 29.7	24.2	312 53.3	36.7	184 28.3	130	7 30.8	+110
12	206 56.9	41 06.5	+ 7 02.0	220 49.6	− 9 25.0	34 31.7	+ 4 24.0	327 55.5	−18 36.8	199 00.3	129	+ 7 41.8	+109
13	221 59.4	56 06.2	01.0	235 51.9	24.7	49 33.7	23.8	342 57.7	36.8	213 32.2	128	7 52.7	+109
14	237 01.8	71 05.9	7 00.0	250 54.2	24.5	64 35.7	23.7	357 59.9	36.9	228 04.0	128	8 03.6	+109
15	252 04.3	86 05.6	· 6 59.0	265 56.5	·· 24.2	79 37.7	·· 23.5	13 02.1	·· 36.9	242 35.8	127	· 8 14.5	+108
16	267 06.8	101 05.3	58.0	280 58.7	23.9	94 39.7	23.3	28 04.3	37.0	257 07.5	127	8 25.3	+108
17	282 09.2	116 05.0	57.0	296 01.0	23.6	109 41.7	23.1	43 06.5	37.1	271 39.2	126	8 36.1	+108
18	297 11.7	131 04.7	+ 6 56.0	311 03.3	− 9 23.3	124 43.7	+ 4 22.9	58 08.7	−18 37.1	286 10.8	126	+ 8 46.9	+107
19	312 14.2	146 04.4	55.0	326 05.6	23.1	139 45.8	22.7	73 10.9	37.2	300 42.4	125	8 57.6	+107
20	327 16.6	161 04.1	54.0	341 07.9	22.8	154 47.8	22.5	88 13.1	37.2	315 13.9	124	9 08.3	+107
21	342 19.1	176 03.8	·· 53.0	356 10.2	·· 22.5	169 49.8	·· 22.3	103 15.3	·· 37.3	329 45.3	124	· 9 19.0	+107
22	357 21.6	191 03.5	52.0	11 12.5	22.2	184 51.8	22.1	118 17.5	37.4	344 16.7	123	9 29.7	+106
23	12 24.0	206 03.2	51.0	26 14.7	21.9	199 53.8	22.0	133 19.7	37.4	358 48.0	123	9 40.3	+105
19 0	27 26.5	221 02.9	+ 6 50.0	41 17.0	− 9 21.6	214 55.8	+ 4 21.8	148 21.9	−18 37.5	13 19.3	122	+ 9 50.8	+105
1	42 29.0	236 02.5	48.9	56 19.3	21.4	229 57.8	21.6	163 24.1	37.5	27 50.5	122	10 01.3	+105
2	57 31.4	251 02.2	47.9	71 21.6	21.1	244 59.8	21.4	178 26.3	37.6	42 21.7	120	10 11.8	+105
3	72 33.9	266 01.9	·· 46.9	86 23.8	·· 20.8	260 01.8	·· 21.2	193 28.5	·· 37.7	56 52.7	120	·10 22.3	+104
4	87 36.3	281 01.6	45.9	101 26.1	20.5	275 03.8	21.0	208 30.7	37.7	71 23.7	120	10 32.7	+103
5	102 38.8	296 01.3	44.9	116 28.4	20.2	290 05.8	20.8	223 32.9	37.8	85 54.7	119	10 43.0	+104
6	117 41.3	311 01.0	+ 6 43.9	131 30.7	− 9 19.9	305 07.9	+ 4 20.6	238 35.1	−18 37.8	100 25.6	118	+10 53.4	+102
7	132 43.7	326 00.7	42.9	146 32.9	19.6	320 09.9	20.4	253 37.3	37.9	114 56.4	118	11 03.6	+103
8	147 46.2	341 00.4	41.9	161 35.2	19.4	335 11.9	20.3	268 39.5	37.9	129 27.2	117	11 13.9	+101
9	162 48.7	356 00.1	·· 40.9	176 37.5	·· 19.1	350 13.9	·· 20.1	283 41.7	·· 38.0	143 57.9	116	·11 24.0	+102
10	177 51.1	10 59.8	39.9	191 39.7	18.8	5 15.9	19.9	298 43.9	38.1	158 28.5	116	11 34.2	+101
11	192 53.6	25 59.5	38.8	206 42.0	18.5	20 17.9	19.7	313 46.0	38.1	172 59.1	115	11 44.3	+100
12	207 56.1	40 59.2	+ 6 37.8	221 44.3	− 9 18.2	35 19.9	+ 4 19.5	328 48.2	−18 38.2	187 29.6	114	+11 54.3	+100
13	222 58.5	55 58.9	36.8	236 46.5	17.9	50 21.9	19.3	343 50.4	38.2	202 00.0	113	12 04.3	+ 99
14	238 01.0	70 58.6	35.8	251 48.8	17.6	65 23.9	19.1	358 52.6	38.3	216 30.3	113	12 14.2	+ 99
15	253 03.5	85 58.3	·· 34.8	266 51.1	·· 17.3	80 26.0	·· 18.9	13 54.8	·· 38.4	231 00.6	113	·12 24.1	+ 98
16	268 05.9	100 58.0	33.8	281 53.3	17.0	95 28.0	18.8	28 57.0	38.4	245 30.9	111	12 33.9	+ 97
17	283 08.4	115 57.7	32.8	296 55.6	16.7	110 30.0	18.6	43 59.2	38.5	260 01.0	111	12 43.6	+ 97
18	298 10.8	130 57.4	+ 6 31.8	311 57.8	− 9 16.5	125 32.0	+ 4 18.4	59 01.4	−18 38.5	274 31.1	110	+12 53.3	+ 97
19	313 13.3	145 57.1	30.7	327 00.1	16.2	140 34.0	18.2	74 03.6	38.6	289 01.1	110	13 03.0	+ 96
20	328 15.8	160 56.8	29.7	342 02.3	15.9	155 36.0	18.0	89 05.8	38.7	303 31.1	109	13 12.6	+ 95
21	343 18.2	175 56.5	·· 28.7	357 04.6	·· 15.6	170 38.0	·· 17.8	104 08.0	·· 38.7	318 01.0	108	·13 22.1	+ 94
22	358 20.7	190 56.2	27.7	12 06.8	15.3	185 40.0	17.6	119 10.2	38.8	332 30.8	107	13 31.5	+ 94
23	13 23.2	205 55.9	26.7	27 09.1	15.0	200 42.0	17.4	134 12.4	38.8	347 00.5	107	13 40.9	+ 94
20 0	28 25.6	220 55.6	+ 6 25.7	42 11.3	− 9 14.7	215 44.1	+ 4 17.3	149 14.6	−18 38.9	1 30.2	106	+13 50.3	+ 92
1	43 28.1	235 55.3	24.6	57 13.6	14.4	230 46.1	17.1	164 16.8	38.9	15 59.8	105	13 59.5	+ 92
2	58 30.6	250 55.0	23.6	72 15.8	14.1	245 48.1	16.9	179 19.0	39.0	30 29.3	105	14 08.7	+ 92
3	73 33.0	265 54.7	·· 22.6	87 18.1	·· 13.8	260 50.1	·· 16.7	194 21.2	·· 39.1	44 58.8	104	·14 17.9	+ 90
4	88 35.5	280 54.4	21.6	102 20.3	13.5	275 52.1	16.5	209 23.4	39.1	59 28.2	103	14 26.9	+ 90
5	103 37.9	295 54.1	20.6	117 22.6	13.2	290 54.1	16.3	224 25.6	39.2	73 57.5	102	14 35.9	+ 90
6	118 40.4	310 53.8	+ 6 19.5	132 24.8	− 9 12.9	305 56.1	+ 4 16.1	239 27.8	−18 39.2	88 26.7	102	+14 44.9	+ 88
7	133 42.9	325 53.5	18.5	147 27.1	12.6	320 58.1	15.9	254 30.0	39.3	102 55.9	101	14 53.7	+ 88
8	148 45.3	340 53.2	17.5	162 29.3	12.3	336 00.2	15.8	269 32.1	39.4	117 25.0	101	15 02.5	+ 87
9	163 47.8	355 52.9	·· 16.5	177 31.5	·· 12.0	351 02.2	·· 15.6	284 34.3	·· 39.4	131 54.1	99	·15 11.2	+ 86
10	178 50.3	10 52.6	15.5	192 33.8	11.7	6 04.2	15.4	299 36.5	39.5	146 23.0	99	15 19.8	+ 86
11	193 52.7	25 52.3	14.4	207 36.0	11.4	21 06.2	15.2	314 38.7	39.5	160 51.9	98	15 28.4	+ 84
12	208 55.2	40 52.0	+ 6 13.4	222 38.3	− 9 11.1	36 08.2	+ 4 15.0	329 40.9	−18 39.6	175 20.7	98	+15 36.8	+ 84
13	223 57.7	55 51.7	12.4	237 40.5	10.8	51 10.2	14.8	344 43.1	39.7	189 49.5	96	15 45.2	+ 83
14	239 00.1	70 51.4	11.4	252 42.7	10.5	66 12.2	14.6	359 45.3	39.7	204 18.1	96	15 53.5	+ 83
15	254 02.6	85 51.1	·· 10.3	267 45.0	·· 10.2	81 14.2	·· 14.4	14 47.5	·· 39.8	218 46.7	96	·16 01.8	+ 81
16	269 05.1	100 50.8	09.3	282 47.2	09.9	96 16.3	14.3	29 49.7	39.8	233 15.3	94	16 09.9	+ 81
17	284 07.5	115 50.5	08.3	297 49.4	09.6	111 18.3	14.1	44 51.9	39.9	247 43.7	94	16 18.0	+ 80
18	299 10.0	130 50.2	+ 6 07.3	312 51.6	− 9 09.3	126 20.3	+ 4 13.9	59 54.1	−18 39.9	262 12.1	93	+16 26.0	+ 78
19	314 12.4	145 49.9	06.2	327 53.9	09.0	141 22.3	13.7	74 56.3	40.0	276 40.4	93	16 33.8	+ 78
20	329 14.9	160 49.6	05.2	342 56.1	08.7	156 24.3	13.5	89 58.5	40.1	291 08.7	92	16 41.6	+ 78
21	344 17.4	175 49.3	·· 04.2	357 58.3	·· 08.4	171 26.3	·· 13.3	105 00.7	·· 40.1	305 36.9	91	·16 49.4	+ 76
22	359 19.8	190 48.9	03.2	13 00.5	08.1	186 28.3	13.1	120 02.9	40.2	320 05.0	90	16 57.0	+ 75
23	14 22.3	205 48.6	02.1	28 02.8	07.8	201 30.4	12.9	135 05.1	40.2	334 33.0	90	17 04.5	+ 75
24	29 24.8	220 48.3	+ 6 01.1	43 05.0	− 9 07.5	216 32.4	+ 4 12.8	150 07.3	−18 40.3	349 01.0	88	+17 12.0	+ 73
code	—	− 3	− 10	+ 22	+ 3	+ 20	− 2	+ 22	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
18 0	183 40.9	− 9 31.8	7	Acamar	315 50.1	−40 28.4
1	198 41.0	32.7	5	Achernar	335 57.7	−57 27.2
2	213 41.2	33.6	30	Acrux	173 57.5	−62 51.5
3	228 41.3	34.5	19	Adhara	255 45.8	−28 54.6
4	243 41.4	35.4	10	Aldebaran	291 37.9	+16 25.5
5	258 41.5	36.3				
6	273 41.7	− 9 37.2	32	Alioth	166 58.5	+56 11.6
7	288 41.8	38.1	34	Alkaid	153 32.8	+49 31.7
8	303 41.9	39.0	55	Al Na'ir	28 36.8	−47 10.3
9	318 42.0	39.9	15	Alnilam	276 29.3	− 1 13.6
10	333 42.1	40.8	25	Alphard	218 38.0	− 8 28.2
11	348 42.3	41.8				
12	3 42.4	− 9 42.7	41	Alphecca	126 47.3	+26 51.7
13	18 42.5	43.6	1	Alpheratz	358 27.2	+28 51.4
14	33 42.6	44.5	51	Altair	62 49.7	+ 8 45.5
15	48 42.7	45.4	2	Ankaa	353 57.2	−42 32.3
16	63 42.9	46.3	42	Antares	113 18.7	−26 20.2
17	78 43.0	47.2				
18	93 43.1	− 9 48.1	37	Arcturus	146 34.8	+19 24.5
19	108 43.2	49.0	43	Atria	108 59.1	−68 57.2
20	123 43.3	49.9	22	Avior	234 35.5	−59 22.0
21	138 43.4	50.8	13	Bellatrix	279 17.4	+ 6 18.8
22	153 43.6	51.7	16	Betelg'se	271 47.1	+ 7 24.1
23	168 43.7	52.6				
			17	Canopus	264 14.8	−52 40.0
19 0	183 43.8	− 9 53.5	12	Capella	281 37.0	+45 57.2
1	198 43.9	54.4	53	Deneb	50 00.4	+45 07.9
2	213 44.0	55.3	28	Denebola	183 17.2	+14 48.8
3	228 44.1	56.2	4	Diphda	349 38.2	−18 13.2
4	243 44.3	57.2				
5	258 44.4	58.1	27	Dubhe	194 44.2	+61 58.8
6	273 44.5	− 9 59.0	14	Elnath	279 06.1	+28 34.3
7	288 44.6	9 59.9	47	Eltanin	91 06.1	+51 30.0
8	303 44.7	10 00.8	54	Enif	34 28.7	+ 9 40.9
9	318 44.8	01.7	56	Fomalhaut	16 10.5	−29 51.0
10	333 44.9	02.6				
11	348 45.1	03.5	31	Gacrux	172 48.9	−56 52.2
12	3 45.2	−10 04.4	29	Gienah	176 36.4	−17 18.1
13	18 45.3	05.3	35	Hadar	149 48.9	−60 09.9
14	33 45.4	06.2	6	Hamal	328 48.4	+23 15.7
15	48 45.5	07.1	48	Kaus Aust.	84 40.3	−34 24.4
16	63 45.6	08.0				
17	78 45.7	08.9	40	Kochab	137 19.2	+74 20.0
18	93 45.8	−10 09.8	57	Markab	14 20.4	+14 58.6
19	108 46.0	10.7	8	Menkar	314 59.2	+ 3 55.4
20	123 46.1	11.6	36	Menkent	148 58.1	−36 09.5
21	138 46.2	12.5	24	Miapl'dus	221 49.1	−69 32.1
22	153 46.3	13.4				
23	168 46.4	14.3	9	Mirfak	309 40.8	+49 42.5
			50	Nunki	76 51.0	−26 21.1
20 0	183 46.5	−10 15.2	52	Peacock	54 26.0	−56 52.6
1	198 46.6	16.1	21	Pollux	244 19.6	+28 07.8
2	213 46.7	17.0	20	Procyon	245 44.2	+ 5 20.2
3	228 46.8	17.9				
4	243 46.9	18.8	46	R'alhague	96 46.1	+12 35.6
5	258 47.0	19.7	26	Regulus	208 28.9	+12 10.7
6	273 47.2	−10 20.6	11	Rigel	281 52.7	− 8 14.9
7	288 47.3	21.5	38	Rigil Kent.	140 50.5	−60 39.5
8	303 47.4	22.4	44	Sabik	103 01.5	−15 40.3
9	318 47.5	23.3				
10	333 47.6	24.1	3	Schedar	350 28.5	+56 18.3
11	348 47.7	25.0	45	Shaula	97 19.9	−37 04.5
12	3 47.8	−10 25.9	18	Sirius	259 11.1	−16 39.2
13	18 47.9	26.8	33	Spica	159 16.4	−10 56.1
14	33 48.0	27.7	23	Suhail	223 23.9	−43 15.3
15	48 48.1	28.6				
16	63 48.2	29.5	49	Vega	81 07.9	+38 44.9
17	78 48.3	30.4	39	Zub'g'bi	137 52.8	−15 51.7
18	93 48.4	−10 31.3				
19	108 48.5	32.2				
20	123 48.6	33.1				
21	138 48.7	34.0				
22	153 48.9	34.9				
23	168 49.0	35.8				
24	183 49.1	−10 36.7				
code	—	− 9				

Lat.	Sunrise	Twlt. begins	Moonrise 18	19	20	21
N °	h m	h m	h m	h m	h m	h m
72	7 44	3 49	15 05	14 48	14 21	
70	7 30	3 59	15 17	15 09	14 59	14 43
68	7 19	4 07	15 27	15 26	15 26	15 29
66	7 10	4 14	15 35	15 39	15 46	15 59
64	7 02	4 20	15 42	15 50	16 03	16 22
62	6 55	4 24	15 48	16 00	16 17	16 40
60	6 49	4 28	15 53	16 08	16 28	16 55
58	6 44	4 31	15 58	16 16	16 38	17 08
56	6 40	4 33	16 02	16 22	16 47	17 19
54	6 35	4 35	16 05	16 28	16 55	17 29
52	6 32	4 38	16 09	16 33	17 02	17 38
50	6 28	4 39	16 12	16 38	17 09	17 46
45	6 21	4 41	16 18	16 48	17 23	18 03
40	6 15	4 44	16 24	16 57	17 34	18 17
35	6 09	4 44	16 29	17 04	17 44	18 29
30	6 04	4 44	16 33	17 11	17 52	18 39
20	5 56	4 42	16 41	17 22	18 07	18 57
10	5 49	4 39	16 47	17 32	18 21	19 12
0	5 42	4 32	16 54	17 42	18 33	19 27
10	5 35	4 24	17 00	17 51	18 45	19 42
20	5 27	4 12	17 07	18 02	18 59	19 57
30	5 18	3 56	17 15	18 14	19 14	20 16
35	5 13	3 45	17 19	18 20	19 23	20 26
40	5 07	3 31	17 24	18 28	19 33	20 39
45	5 00	3 13	17 30	18 37	19 45	20 53
50	4 51	2 50	17 37	18 48	20 00	21 11
52	4 47	2 39	17 41	18 54	20 07	21 19
54	4 43	2 24	17 45	18 59	20 15	21 29
56	4 38	2 07	17 49	19 06	20 23	21 39
58	4 33	1 45	17 53	19 13	20 33	21 51
60	4 27	1 14	17 58	19 21	20 44	22 05
S						

Lat.	Sunset	Twlt. ends	Moonset 18	19	20	21
N °	h m	h m	h m	h m	h m	h m
72	15 44	19 35	5 54	7 50	10 01	
70	15 58	19 25	5 44	7 31	9 25	11 33
68	16 10	19 18	5 37	7 16	8 59	10 47
66	16 19	19 11	5 30	7 03	8 40	10 17
64	16 27	19 06	5 25	6 53	8 24	9 55
62	16 34	19 02	5 20	6 45	8 11	9 37
60	16 40	18 59	5 16	6 37	8 00	9 23
58	16 45	18 56	5 12	6 31	7 51	9 10
56	16 50	18 54	5 09	6 25	7 42	8 59
54	16 54	18 52	5 06	6 20	7 35	8 50
52	16 57	18 49	5 03	6 15	7 28	8 41
50	17 01	18 49	5 01	6 11	7 22	8 34
45	17 08	18 46	4 56	6 02	7 10	8 18
40	17 15	18 45	4 52	5 55	6 59	8 04
35	17 20	18 44	4 48	5 48	6 50	7 53
30	17 25	18 45	4 45	5 43	6 42	7 43
20	17 34	18 48	4 39	5 33	6 29	7 27
10	17 41	18 52	4 34	5 24	6 17	7 12
0	17 48	18 58	4 30	5 16	6 06	6 58
10	17 56	19 07	4 25	5 09	5 55	6 45
20	18 04	19 20	4 20	5 00	5 43	6 30
30	18 13	19 36	4 14	4 50	5 30	6 14
35	18 18	19 47	4 11	4 45	5 22	6 04
40	18 24	20 01	4 08	4 39	5 13	5 53
45	18 31	20 19	4 03	4 31	5 03	5 40
50	18 40	20 44	3 59	4 23	4 51	5 24
52	18 44	20 56	3 56	4 19	4 45	5 17
54	18 48	21 11	3 54	4 14	4 39	5 09
56	18 53	21 29	3 51	4 10	4 32	5 00
58	18 58	21 52	3 48	4 04	4 24	4 50
60	19 05	22 26	3 44	3 58	4 15	4 38
S						

GMT	Equation of Time (App.—Mean) 18	19	20
h	m s	m s	m s
0	+14 43.5	+14 54.9	+15 05.8
6	+14 46.4	+14 57.7	+15 08.4
12	+14 49.3	+15 00.4	+15 11.0
18	+14 52.1	+15 03.1	+15 13.5
24	+14 54.9	+15 05.8	+15 16.0

GMT of Transit Meridian of Greenwich DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
18	23 05	9 16	21 15	9 42	14 08
19	23 54	9 16	21 12	9 39	14 05
20	24 46	9 17	21 08	9 36	14 01
21	0 46	9 17	21 05	9 33	13 58

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.4	0.1	0.3
30	0.4	0.1	0.2
45	0.4	0.1	0.2
60	0.4	0.1	0.1
75	0.4	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	18	19	20
°	′	′	′
0	14.7	15.4	16.1
4	14.7	15.4	16.1
8	14.7	15.4	16.1
12	14.7	15.4	16.0
16	14.7	15.4	16.0
20	14.7	15.4	16.0
24	14.7	15.4	16.0
28	14.8	15.4	16.0
32	14.8	15.4	16.0
36	14.8	15.4	16.0
40	14.8	15.4	16.0
44	14.9	15.5	15.9
48	14.9	15.5	15.9
52	14.9	15.5	15.9
56	15.0	15.5	15.9
60	15.0	15.5	15.8
64	15.1	15.5	15.8
68	15.1	15.5	15.8
72	15.2	15.5	15.8
76	15.2	15.5	15.7
80	15.3	15.5	15.7
84	15.3	15.5	15.7
88	15.3	15.5	15.7
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	18	19	20
°	′	′	′
0	16.1	15.6	15.3
4	16.1	15.6	15.3
8	16.0	15.6	15.3
12	16.0	15.6	15.3
16	16.0	15.6	15.3
20	16.0	15.6	15.3
24	16.0	15.6	15.3
28	16.0	15.6	15.3
32	15.9	15.6	15.3
36	15.9	15.6	15.3
40	15.9	15.6	15.4
44	15.8	15.6	15.4
48	15.8	15.6	15.4
52	15.8	15.6	15.4
56	15.7	15.6	15.4
60	15.7	15.6	15.5
64	15.6	15.6	15.5
68	15.6	15.6	15.5
72	15.6	15.6	15.5
76	15.5	15.5	15.6
80	15.5	15.5	15.6
84	15.4	15.5	15.6
88	15.4	15.5	15.7
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.6 GHA	VENUS −3.6 Dec.	MARS −1.6 GHA	MARS −1.6 Dec.	JUPITER −1.3 GHA	JUPITER −1.3 Dec.	SATURN 0.8 GHA	SATURN 0.8 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
21 0	29 24.8	220 48.3	+ 6 01.1	43 05.0	− 9 07.5	216 32.4	+ 4 12.8	150 07.3	−18 40.3	349 01.0	88	+17 12.0	+ 73
1	44 27.2	235 48.0	6 00.1	58 07.2	07.2	231 34.4	12.6	165 09.4	40.4	3 28.8	89	17 19.3	+ 73
2	59 29.7	250 47.7	5 59.0	73 09.4	06.9	246 36.4	12.4	180 11.6	40.4	17 56.7	87	17 26.6	+ 71
3	74 32.2	265 47.4	·· 58.0	88 11.6	·· 06.6	261 38.4	·· 12.2	195 13.8	·· 40.5	32 24.4	87	·17 33.7	+ 71
4	89 34.6	280 47.1	57.0	103 13.9	06.3	276 40.4	12.0	210 16.0	40.5	46 52.1	86	17 40.8	+ 70
5	104 37.1	295 46.8	55.9	118 16.1	06.0	291 42.4	11.8	225 18.2	40.6	61 19.7	86	17 47.8	+ 68
6	119 39.5	310 46.5	+ 5 54.9	133 18.3	− 9 05.7	306 44.5	+ 4 11.6	240 20.4	−18 40.7	75 47.3	85	+17 54.6	+ 68
7	134 42.0	325 46.2	53.9	148 20.5	05.4	321 46.5	11.5	255 22.6	40.7	90 14.8	84	18 01.4	+ 67
8	149 44.5	340 45.9	52.9	163 22.7	05.1	336 48.5	11.3	270 24.8	40.8	104 42.2	83	18 08.1	+ 65
9	164 46.9	355 45.6	·· 51.8	178 24.9	·· 04.8	351 50.5	·· 11.1	285 27.0	·· 40.8	119 09.5	83	·18 14.6	+ 65
10	179 49.4	10 45.3	50.8	193 27.1	04.5	6 52.5	10.9	300 29.2	40.9	133 36.8	82	18 21.1	+ 63
11	194 51.9	25 45.0	49.8	208 29.3	04.1	21 54.5	10.7	315 31.4	41.0	148 04.0	82	18 27.4	+ 63
12	209 54.3	40 44.7	+ 5 48.7	223 31.6	− 9 03.8	36 56.6	+ 4 10.5	330 33.6	−18 41.0	162 31.2	81	+18 33.7	+ 61
13	224 56.8	55 44.4	47.7	238 33.8	03.5	51 58.6	10.3	345 35.8	41.1	176 58.3	80	18 39.8	+ 61
14	239 59.3	70 44.1	46.7	253 36.0	03.2	67 00.6	10.2	0 37.9	41.1	191 25.3	79	18 45.9	+ 59
15	255 01.7	85 43.8	·· 45.6	268 38.2	·· 02.9	82 02.6	·· 10.0	15 40.1	·· 41.2	205 52.2	79	·18 51.8	+ 58
16	270 04.2	100 43.5	44.6	283 40.4	02.6	97 04.6	09.8	30 42.3	41.2	220 19.1	79	18 57.6	+ 57
17	285 06.7	115 43.2	43.6	298 42.6	02.3	112 06.6	09.6	45 44.5	41.3	234 46.0	77	19 03.3	+ 56
18	300 09.1	130 42.9	+ 5 42.5	313 44.8	− 9 02.0	127 08.6	+ 4 09.4	60 46.7	−18 41.4	249 12.7	77	+19 08.9	+ 55
19	315 11.6	145 42.6	41.5	328 47.0	01.7	142 10.7	09.2	75 48.9	41.4	263 39.4	77	19 14.4	+ 54
20	330 14.0	160 42.3	40.4	343 49.2	01.3	157 12.7	09.0	90 51.1	41.5	278 06.1	76	19 19.8	+ 53
21	345 16.5	175 42.0	·· 39.4	358 51.4	·· 01.0	172 14.7	·· 08.8	105 53.3	·· 41.5	292 32.7	75	·19 25.1	+ 51
22	0 19.0	190 41.7	38.4	13 53.6	00.7	187 16.7	08.7	120 55.5	41.6	306 59.2	75	19 30.2	+ 50
23	15 21.4	205 41.4	37.3	28 55.8	00.4	202 18.7	08.5	135 57.7	41.7	321 25.7	74	19 35.2	+ 50
22 0	30 23.9	220 41.1	+ 5 36.3	43 57.9	− 9 00.1	217 20.7	+ 4 08.3	150 59.9	−18 41.7	335 52.1	74	+19 40.2	+ 48
1	45 26.4	235 40.8	35.3	59 00.1	8 59.8	232 22.8	08.1	166 02.1	41.8	350 18.5	73	19 45.0	+ 46
2	60 28.8	250 40.5	34.2	74 02.3	59.5	247 24.8	07.9	181 04.2	41.8	4 44.8	72	19 49.6	+ 46
3	75 31.3	265 40.2	·· 33.2	89 04.5	·· 59.2	262 26.8	·· 07.7	196 06.4	·· 41.9	19 11.0	72	·19 54.2	+ 44
4	90 33.8	280 39.9	32.1	104 06.7	58.8	277 28.8	07.5	211 08.6	42.0	33 37.2	72	19 58.6	+ 44
5	105 36.2	295 39.6	31.1	119 08.9	58.5	292 30.8	07.4	226 10.8	42.0	48 03.4	70	20 03.0	+ 41
6	120 38.7	310 39.3	+ 5 30.1	134 11.1	− 8 58.2	307 32.8	+ 4 07.2	241 13.0	−18 42.1	62 29.4	71	+20 07.1	+ 41
7	135 41.2	325 39.0	29.0	149 13.3	57.9	322 34.9	07.0	256 15.2	42.1	76 55.5	70	20 11.2	+ 40
8	150 43.6	340 38.7	28.0	164 15.4	57.6	337 36.9	06.8	271 17.4	42.2	91 21.5	69	20 15.2	+ 38
9	165 46.1	355 38.4	·· 26.9	179 17.6	·· 57.3	352 38.9	·· 06.6	286 19.6	·· 42.3	105 47.4	69	·20 19.0	+ 37
10	180 48.5	10 38.1	25.9	194 19.8	56.9	7 40.9	06.4	301 21.8	42.3	120 13.3	69	20 22.7	+ 36
11	195 51.0	25 37.8	24.9	209 22.0	56.6	22 42.9	06.3	316 24.0	42.4	134 39.2	68	20 26.3	+ 34
12	210 53.5	40 37.5	+ 5 23.8	224 24.2	− 8 56.3	37 45.0	+ 4 06.1	331 26.2	−18 42.4	149 05.0	67	+20 29.7	+ 33
13	225 55.9	55 37.2	22.8	239 26.4	56.0	52 47.0	05.9	346 28.3	42.5	163 30.7	68	20 33.0	+ 32
14	240 58.4	70 36.9	21.7	254 28.5	55.7	67 49.0	05.7	1 30.5	42.5	177 56.5	66	20 36.2	+ 31
15	256 00.9	85 36.6	·· 20.7	269 30.7	·· 55.3	82 51.0	·· 05.5	16 32.7	·· 42.6	192 22.1	67	·20 39.3	+ 29
16	271 03.3	100 36.3	19.6	284 32.9	55.0	97 53.0	05.3	31 34.9	42.7	206 47.8	65	20 42.2	+ 29
17	286 05.8	115 36.0	18.6	299 35.1	54.7	112 55.0	05.1	46 37.1	42.7	221 13.3	66	20 45.1	+ 26
18	301 08.3	130 35.7	+ 5 17.5	314 37.2	− 8 54.4	127 57.1	+ 4 05.0	61 39.3	−18 42.8	235 38.9	65	+20 47.7	+ 26
19	316 10.7	145 35.3	16.5	329 39.4	54.1	142 59.1	04.8	76 41.5	42.8	250 04.4	65	20 50.3	+ 24
20	331 13.2	160 35.0	15.5	344 41.6	53.7	158 01.1	04.6	91 43.7	42.9	264 29.9	64	20 52.7	+ 23
21	346 15.7	175 34.7	·· 14.4	359 43.7	·· 53.4	173 03.1	·· 04.4	106 45.9	·· 43.0	278 55.3	64	·20 55.0	+ 21
22	1 18.1	190 34.4	13.4	14 45.9	53.1	188 05.1	04.2	121 48.1	43.0	293 20.7	64	20 57.1	+ 21
23	16 20.6	205 34.1	12.3	29 48.1	52.8	203 07.2	04.0	136 50.2	43.1	307 46.1	64	20 59.2	+ 18
23 0	31 23.0	220 33.8	+ 5 11.3	44 50.2	− 8 52.4	218 09.2	+ 4 03.8	151 52.4	−18 43.1	322 11.5	63	+21 01.0	+ 18
1	46 25.5	235 33.5	10.2	59 52.4	52.1	233 11.2	03.7	166 54.6	43.2	336 36.8	63	21 02.8	+ 16
2	61 28.0	250 33.2	09.2	74 54.6	51.8	248 13.2	03.5	181 56.8	43.3	351 02.1	62	21 04.4	+ 15
3	76 30.4	265 32.9	·· 08.1	89 56.7	·· 51.5	263 15.2	·· 03.3	196 59.0	·· 43.3	5 27.3	63	·21 05.9	+ 13
4	91 32.9	280 32.6	07.1	104 58.9	51.1	278 17.3	03.1	212 01.2	43.4	19 52.6	62	21 07.2	+ 13
5	106 35.4	295 32.3	06.0	120 01.0	50.8	293 19.3	02.9	227 03.4	43.4	34 17.8	61	21 08.5	+ 10
6	121 37.8	310 32.0	+ 5 05.0	135 03.2	− 8 50.5	308 21.3	+ 4 02.7	242 05.6	−18 43.5	48 42.9	62	+21 09.5	+ 10
7	136 40.3	325 31.7	03.9	150 05.4	50.2	323 23.3	02.6	257 07.8	43.6	63 08.1	61	21 10.5	+ 8
8	151 42.8	340 31.4	02.9	165 07.5	49.8	338 25.3	02.4	272 09.9	43.6	77 33.2	62	21 11.3	+ 7
9	166 45.2	355 31.1	·· 01.8	180 09.7	·· 49.5	353 27.4	·· 02.2	287 12.1	·· 43.7	91 58.4	61	·21 12.0	+ 5
10	181 47.7	10 30.8	5 00.8	195 11.8	49.2	8 29.4	02.0	302 14.3	43.7	106 23.5	61	21 12.5	+ 4
11	196 50.1	25 30.5	4 59.7	210 14.0	48.9	23 31.4	01.8	317 16.5	43.8	120 48.6	60	21 12.9	+ 2
12	211 52.6	40 30.2	+ 4 58.7	225 16.1	− 8 48.5	38 33.4	+ 4 01.6	332 18.7	−18 43.8	135 13.6	61	+21 13.1	+ 2
13	226 55.1	55 29.9	57.6	240 18.3	48.2	53 35.4	01.5	347 20.9	43.9	149 38.7	60	21 13.3	− 1
14	241 57.5	70 29.6	56.6	255 20.4	47.9	68 37.5	01.3	2 23.1	44.0	164 03.7	60	21 13.2	− 1
15	257 00.0	85 29.3	·· 55.5	270 22.6	·· 47.6	83 39.5	·· 01.1	17 25.3	·· 44.0	178 28.7	61	·21 13.1	− 3
16	272 02.5	100 29.0	54.5	285 24.7	47.2	98 41.5	00.9	32 27.5	44.1	192 53.8	60	21 12.8	− 4
17	287 04.9	115 28.7	53.4	300 26.9	46.9	113 43.5	00.7	47 29.6	44.1	207 18.8	60	21 12.4	− 6
18	302 07.4	130 28.4	+ 4 52.3	315 29.0	− 8 46.6	128 45.5	+ 4 00.5	62 31.8	−18 44.2	221 43.8	60	+21 11.8	− 7
19	317 09.9	145 28.1	51.3	330 31.2	46.2	143 47.6	00.3	77 34.0	44.3	236 08.8	60	21 11.1	− 9
20	332 12.3	160 27.8	50.2	345 33.3	45.9	158 49.6	00.2	92 36.2	44.3	250 33.8	59	21 10.2	− 9
21	347 14.8	175 27.5	·· 49.2	0 35.4	·· 45.6	173 51.6	· 4 00.0	107 38.4	·· 44.4	264 58.7	60	·21 09.3	− 12
22	2 17.3	190 27.2	48.1	15 37.6	45.2	188 53.6	3 59.8	122 40.6	44.4	279 23.7	60	21 08.1	− 12
23	17 19.7	205 26.9	47.1	30 39.7	44.9	203 55.6	59.6	137 42.8	44.5	293 48.7	60	21 06.9	− 14
24	32 22.2	220 26.6	+ 4 46.0	45 41.9	− 8 44.6	218 57.7	+ 3 59.4	152 45.0	−18 44.6	308 13.7	60	+21 05.5	− 15
code	—	− 3	− 10	+ 22	+ 3	+ 20	− 2	+ 21	− 1				

G M T	SUN GHA	SUN Dec.
h	° ′	° ′
21 0	183 49.1	−10 36.7
1	198 49.2	37.6
2	213 49.3	38.4
3	228 49.4	39.3
4	243 49.5	40.2
5	258 49.6	41.1
6	273 49.7	−10 42.0
7	288 49.8	42.9
8	303 49.9	43.8
9	318 50.0	44.7
10	333 50.1	45.6
11	348 50.2	46.5
12	3 50.3	−10 47.3
13	18 50.4	48.2
14	33 50.5	49.1
15	48 50.6	50.0
16	63 50.7	50.9
17	78 50.8	51.8
18	93 50.9	−10 52.7
19	108 51.0	53.6
20	123 51.1	54.5
21	138 51.2	55.3
22	153 51.3	56.2
23	168 51.3	57.1
22 0	183 51.4	−10 58.0
1	198 51.5	58.9
2	213 51.6	10 59.8
3	228 51.7	11 00.7
4	243 51.8	01.5
5	258 51.9	02.4
6	273 52.0	−11 03.3
7	288 52.1	04.2
8	303 52.2	05.1
9	318 52.3	06.0
10	333 52.4	06.8
11	348 52.5	07.7
12	3 52.6	−11 08.6
13	18 52.7	09.5
14	33 52.8	10.4
15	48 52.8	11.2
16	63 52.9	12.1
17	78 53.0	13.0
18	93 53.1	−11 13.9
19	108 53.2	14.8
20	123 53.3	15.6
21	138 53.4	16.5
22	153 53.5	17.4
23	168 53.6	18.3
23 0	183 53.7	−11 19.2
1	198 53.7	20.0
2	213 53.8	20.9
3	228 53.9	21.8
4	243 54.0	22.7
5	258 54.1	23.6
6	273 54.2	−11 24.4
7	288 54.3	25.3
8	303 54.4	26.2
9	318 54.4	27.1
10	333 54.5	27.9
11	348 54.6	28.8
12	3 54.7	−11 29.7
13	18 54.8	30.6
14	33 54.9	31.4
15	48 55.0	32.3
16	63 55.0	33.2
17	78 55.1	34.1
18	93 55.2	−11 34.9
19	108 55.3	35.8
20	123 55.4	36.7
21	138 55.5	37.5
22	153 55.5	38.4
23	168 55.6	39.3
24	183 55.7	−11 40.2
code	—	− 9

STARS No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 50.1	−40 28.5
5	Achernar	335 57.7	−57 27.2
30	Acrux	173 57.5	−62 51.5
19	Adhara	255 45.8	−28 54.6
10	Aldebaran	291 37.9	+16 25.5
32	Alioth	166 58.5	+56 11.5
34	Alkaid	153 32.8	+49 31.7
55	Al Na'ir	28 36.8	−47 10.3
15	Alnilam	276 29.3	− 1 13.6
25	Alphard	218 37.9	− 8 28.2
41	Alphecca	126 47.3	+26 51.7
1	Alpheratz	358 27.2	+28 51.4
51	Altair	62 49.7	+ 8 45.5
2	Ankaa	353 57.2	−42 32.3
42	Antares	113 18.7	−26 20.2
37	Arcturus	146 34.8	+19 24.5
43	Atria	108 59.1	−68 57.2
22	Avior	234 35.5	−59 22.0
13	Bellatrix	279 17.4	+ 6 18.8
16	Betelg'se	271 47.1	+ 7 24.1
17	Canopus	264 14.8	−52 40.1
12	Capella	281 37.0	+45 57.2
53	Deneb	50 00.4	+45 07.9
28	Denebola	183 17.2	+14 48.8
4	Diphda	349 38.2	−18 13.2
27	Dubhe	194 44.2	+61 58.8
14	Elnath	279 06.1	+28 34.3
47	Eltanin	91 06.2	+51 30.0
54	Enif	34 28.7	+ 9 40.9
56	Fomalhaut	16 10.5	−29 51.0
31	Gacrux	172 48.8	−56 52.2
29	Gienah	176 36.3	−17 18.1
35	Hadar	149 48.9	−60 09.9
6	Hamal	328 48.4	+23 15.7
48	Kaus Aust.	84 40.3	−34 24.4
40	Kochab	137 19.2	+74 20.0
57	Markab	14 20.4	+14 58.6
8	Menkar	314 59.2	+ 3 55.4
36	Menkent	148 58.1	−36 09.4
24	Miapl'dus	221 49.0	−69 32.1
9	Mirfak	309 40.8	+49 42.6
50	Nunki	76 51.0	−26 21.1
52	Peacock	54 26.0	−56 52.6
21	Pollux	244 19.6	+28 07.8
20	Procyon	245 44.1	+ 5 20.2
46	R'alhague	96 46.1	+12 35.6
26	Regulus	208 28.9	+12 10.7
11	Rigel	281 52.7	− 8 14.9
38	Rigil Kent.	140 50.5	−60 39.5
44	Sabik	103 01.5	−15 40.3
3	Schedar	350 28.5	+56 18.3
45	Shaula	97 19.9	−37 04.5
18	Sirius	259 11.0	−16 39.2
33	Spica	159 16.4	−10 56.1
23	Suhail	223 23.8	−43 15.3
49	Vega	81 07.9	+38 44.9
39	Zub'g'bi	137 52.8	−15 51.7

Lat.	Sunrise	Twlt. begins	Moonrise 21	22	23	24
N °	h m	h m	h m	h m	h m	h m
72	8 00	4 03	□	□	□	□
70	7 43	4 11	14 43	□	□	□
68	7 30	4 19	15 29	15 40	16 19	17 48
66	7 20	4 23	15 59	16 24	17 12	18 29
64	7 11	4 28	16 22	16 53	17 44	18 57
62	7 03	4 32	16 40	17 16	18 08	19 19
60	6 57	4 35	16 55	17 34	18 27	19 36
58	6 51	4 38	17 08	17 49	18 43	19 51
56	6 46	4 40	17 19	18 02	18 56	20 04
54	6 41	4 41	17 29	18 13	19 08	20 14
52	6 37	4 42	17 38	18 23	19 18	20 24
50	6 33	4 43	17 46	18 32	19 28	20 33
45	6 25	4 45	18 03	18 51	19 47	20 51
40	6 18	4 47	18 17	19 06	20 03	21 06
35	6 12	4 47	18 29	19 19	20 16	21 18
30	6 07	4 46	18 39	19 31	20 28	21 29
20	5 57	4 43	18 57	19 50	20 48	21 48
10	5 49	4 38	19 12	20 08	21 05	22 04
0	5 41	4 31	19 27	20 24	21 22	22 20
10	5 33	4 22	19 42	20 40	21 38	22 35
20	5 25	4 09	19 57	20 57	21 55	22 51
30	5 15	3 52	20 16	21 17	22 15	23 10
35	5 09	3 40	20 26	21 28	22 27	23 21
40	5 02	3 26	20 39	21 42	22 41	23 34
45	4 54	3 07	20 53	21 58	22 56	23 48
50	4 45	2 41	21 11	22 17	23 16	24 06
52	4 41	2 28	21 19	22 26	23 25	24 15
54	4 36	2 12	21 29	22 37	23 36	24 24
56	4 31	1 53	21 39	22 48	23 48	24 35
58	4 25	1 26	21 51	23 02	24 01	0 01
60	4 18	0 46	22 05	23 18	24 17	0 17
S						

Lat.	Sunset	Twlt. ends	Moonset 21	22	23	24
N °	h m	h m	h m	h m	h m	h m
72	15 28	19 20	□	□	□	□
70	15 44	19 12	11 33	□	□	□
68	15 57	19 06	10 47	12 33	13 54	14 28
66	16 08	19 01	10 17	11 49	13 01	13 46
64	16 17	18 57	9 55	11 20	12 29	13 17
62	16 25	18 54	9 37	10 57	12 05	12 55
60	16 31	18 51	9 23	10 40	11 46	12 37
58	16 37	18 49	9 10	10 25	11 30	12 23
56	16 42	18 46	8 59	10 12	11 17	12 10
54	16 47	18 45	8 50	10 01	11 05	11 59
52	16 51	18 44	8 41	9 51	10 55	11 49
50	16 55	18 43	8 34	9 42	10 45	11 40
45	17 03	18 41	8 18	9 24	10 26	11 21
40	17 11	18 41	8 04	9 09	10 10	11 06
35	17 17	18 42	7 53	8 56	9 57	10 53
30	17 22	18 42	7 43	8 45	9 45	10 42
20	17 32	18 46	7 27	8 26	9 25	10 22
10	17 40	18 51	7 12	8 09	9 07	10 05
0	17 48	18 58	6 58	7 54	8 51	9 49
10	17 56	19 08	6 45	7 38	8 35	9 34
20	18 05	19 21	6 30	7 22	8 17	9 16
30	18 15	19 39	6 14	7 03	7 57	8 57
35	18 21	19 51	6 04	6 52	7 45	8 45
40	18 28	20 07	5 53	6 39	7 32	8 32
45	18 35	20 25	5 40	6 24	7 16	8 16
50	18 45	20 52	5 24	6 06	6 56	7 57
52	18 49	21 05	5 17	5 57	6 47	7 48
54	18 54	21 21	5 09	5 47	6 36	7 37
56	19 00	21 42	5 00	5 37	6 25	7 26
58	19 06	22 10	4 50	5 24	6 11	7 12
60	19 13	22 57	4 38	5 10	5 55	6 56
S						

G M T	Equation of Time (App.—Mean) 21	22	23
h	m s	m s	m s
0	+15 16.0	+15 25.6	+15 34.5
6	+15 18.5	+15 27.9	+15 36.6
12	+15 20.9	+15 30.1	+15 38.6
18	+15 23.3	+15 32.3	+15 40.7
24	+15 25.6	+15 34.5	+15 42.6

GMT of Transit Meridian of Greenwich DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
21	0 46	9 17	21 05	9 33	13 58
22	1 40	9 18	21 01	9 29	13 54
23	2 37	9 18	20 58	9 26	13 51
24	3 36	9 18	20 54	9 23	13 47

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.4	0.1	0.3
30	0.4	0.1	0.2
45	0.4	0.1	0.2
60	0.4	0.1	0.1
75	0.4	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	21	22	23
°	′	′	′
0	16.7	17.3	17.7
4	16.7	17.3	17.7
8	16.7	17.3	17.7
12	16.7	17.3	17.7
16	16.7	17.3	17.6
20	16.6	17.2	17.6
24	16.6	17.2	17.5
28	16.6	17.1	17.5
32	16.5	17.1	17.4
36	16.5	17.0	17.4
40	16.5	17.0	17.3
44	16.4	16.9	17.2
48	16.4	16.8	17.1
52	16.3	16.8	17.0
56	16.3	16.7	16.9
60	16.2	16.6	16.8
64	16.2	16.5	16.7
68	16.1	16.4	16.6
72	16.0	16.3	16.5
76	16.0	16.2	16.4
80	15.9	16.1	16.3
84	15.9	16.0	16.1
88	15.8	16.0	16.0
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	21	22	23
°	′	′	′
0	14.9	14.5	14.3
4	14.9	14.5	14.3
8	14.9	14.6	14.3
12	14.9	14.6	14.4
16	14.9	14.6	14.4
20	15.0	14.6	14.4
24	15.0	14.7	14.5
28	15.0	14.7	14.5
32	15.0	14.8	14.6
36	15.1	14.8	14.7
40	15.1	14.9	14.8
44	15.2	15.0	14.8
48	15.2	15.0	14.9
52	15.3	15.1	15.0
56	15.3	15.2	15.1
60	15.4	15.3	15.2
64	15.4	15.4	15.3
68	15.5	15.5	15.4
72	15.5	15.5	15.5
76	15.6	15.6	15.7
80	15.7	15.7	15.8
84	15.7	15.8	15.9
88	15.8	15.9	16.0
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.6 GHA	VENUS −3.6 Dec	MARS −1.5 GHA	MARS −1.5 Dec.	JUPITER −1.3 GHA	JUPITER −1.3 Dec.	SATURN 0.8 GHA	SATURN 0.8 Dec	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
24 0	32 22.2	220 26.6	+ 4 46.0	45 41.9	− 8 44.6	218 57.7	+ 3 59.4	152 45.0	−18 44.6	308 13.7	60	+21 05.5	− 15
1	47 24.6	235 26.3	45.0	60 44.0	44.2	233 59.7	59.2	167 47.2	44.6	322 38.7	60	21 04.0	− 17
2	62 27.1	250 26.0	43.9	75 46.1	43.9	249 01.7	59.1	182 49.3	44.7	337 03.7	60	21 02.3	− 18
3	77 29.6	265 25.7	·· 42.8	90 48.3	·· 43.6	264 03.7	·· 58.9	197 51.5	·· 44.7	351 28.7	60	·21 00.5	− 20
4	92 32.0	280 25.4	41.8	105 50.4	43.2	279 05.8	58.7	212 53.7	44.8	5 53.7	60	20 58.5	− 21
5	107 34.5	295 25.1	40.7	120 52.5	42.9	294 07.8	58.5	227 55.9	44.9	20 18.7	60	20 56.4	− 22
6	122 37.0	310 24.8	+ 4 39.7	135 54.7	− 8 42.6	309 09.8	+ 3 58.3	242 58.1	−18 44.9	34 43.7	60	+20 54.2	− 23
7	137 39.4	325 24.4	38.6	150 56.8	42.2	324 11.8	58.1	258 00.3	45.0	49 08.7	60	20 51.9	− 25
8	152 41.9	340 24.1	37.5	165 58.9	41.9	339 13.8	58.0	273 02.5	45.0	63 33.7	61	20 49.4	− 27
9	167 44.4	355 23.8	·· 36.5	181 01.0	·· 41.6	354 15.9	·· 57.8	288 04.6	·· 45.1	77 58.8	60	·20 46.7	− 27
10	182 46.8	10 23.5	35.4	196 03.2	41.2	9 17.9	57.6	303 06.8	45.2	92 23.8	61	20 44.0	− 29
11	197 49.3	25 23.2	34.4	211 05.3	40.9	24 19.9	57.4	318 09.0	45.2	106 48.9	61	20 41.1	− 31
12	212 51.8	40 22.9	+ 4 33.3	226 07.4	− 8 40.6	39 21.9	+ 3 57.2	333 11.2	−18 45.3	121 14.0	61	+20 38.0	− 31
13	227 54.2	55 22.6	32.2	241 09.5	40.2	54 24.0	57.0	348 13.4	45.3	135 39.1	61	20 34.9	− 33
14	242 56.7	70 22.3	31.2	256 11.7	39.9	69 26.0	56.9	3 15.6	45.4	150 04.2	62	20 31.6	− 35
15	257 59.1	85 22.0	·· 30.1	271 13.8	·· 39.5	84 28.0	·· 56.7	18 17.8	·· 45.4	164 29.4	61	·20 28.1	− 36
16	273 01.6	100 21.7	29.1	286 15.9	39.2	99 30.0	56.5	33 20.0	45.5	178 54.5	62	20 24.5	− 37
17	288 04.1	115 21.4	28.0	301 18.0	38.9	114 32.0	56.3	48 22.1	45.6	193 19.7	62	20 20.8	− 38
18	303 06.5	130 21.1	+ 4 26.9	316 20.1	− 8 38.5	129 34.1	+ 3 56.1	63 24.3	−18 45.6	207 44.9	62	+20 17.0	− 40
19	318 09.0	145 20.8	25.9	331 22.3	38.2	144 36.1	55.9	78 26.5	45.7	222 10.1	63	20 13.0	− 41
20	333 11.5	160 20.5	24.8	346 24.4	37.8	159 38.1	55.8	93 28.7	45.7	236 35.4	63	20 08.9	− 42
21	348 13.9	175 20.2	·· 23.7	1 26.5	·· 37.5	174 40.1	·· 55.6	108 30.9	·· 45.8	251 00.7	63	·20 04.7	− 44
22	3 16.4	190 19.9	22.7	16 28.6	37.2	189 42.2	55.4	123 33.1	45.9	265 26.0	63	20 00.3	− 45
23	18 18.9	205 19.6	21.6	31 30.7	36.8	204 44.2	55.2	138 35.3	45.9	279 51.3	64	19 55.8	− 46
25 0	33 21.3	220 19.3	+ 4 20.6	46 32.8	− 8 36.5	219 46.2	+ 3 55.0	153 37.4	−18 46.0	294 16.7	64	+19 51.2	− 47
1	48 23.8	235 19.0	19.5	61 34.9	36.1	234 48.2	54.9	168 39.6	46.0	308 42.1	64	19 46.5	− 49
2	63 26.2	250 18.7	18.4	76 37.0	35.8	249 50.3	54.7	183 41.8	46.1	323 07.5	64	19 41.6	− 50
3	78 28.7	265 18.4	·· 17.4	91 39.2	·· 35.5	264 52.3	·· 54.5	198 44.0	·· 46.2	337 32.9	65	·19 36.6	− 52
4	93 31.2	280 18.1	16.3	106 41.3	35.1	279 54.3	54.3	213 46.2	46.2	351 58.4	66	19 31.4	− 52
5	108 33.6	295 17.8	15.2	121 43.4	34.8	294 56.3	54.1	228 48.4	46.3	6 24.0	65	19 26.2	− 54
6	123 36.1	310 17.5	+ 4 14.2	136 45.5	− 8 34.4	309 58.4	+ 3 53.9	243 50.6	−18 46.3	20 49.5	66	+19 20.8	− 55
7	138 38.6	325 17.2	13.1	151 47.6	34.1	325 00.4	53.8	258 52.7	46.4	35 15.1	66	19 15.3	− 56
8	153 41.0	340 16.9	12.0	166 49.7	33.7	340 02.4	53.6	273 54.9	46.5	49 40.7	67	19 09.7	− 58
9	168 43.5	355 16.6	·· 11.0	181 51.8	·· 33.4	355 04.4	·· 53.4	288 57.1	·· 46.5	64 06.4	67	·19 03.9	− 59
10	183 46.0	10 16.3	09.9	196 53.9	33.0	10 06.5	53.2	303 59.3	46.6	78 32.1	67	18 58.0	− 60
11	198 48.4	25 15.9	08.8	211 56.0	32.7	25 08.5	53.0	319 01.5	46.6	92 57.8	68	18 52.0	− 61
12	213 50.9	40 15.6	+ 4 07.7	226 58.1	− 8 32.4	40 10.5	+ 3 52.8	334 03.7	−18 46.7	107 23.6	68	+18 45.9	− 63
13	228 53.4	55 15.3	06.7	242 00.2	32.0	55 12.5	52.7	349 05.9	46.8	121 49.4	69	18 39.6	− 63
14	243 55.8	70 15.0	05.6	257 02.3	31.7	70 14.6	52.5	4 08.0	46.8	136 15.3	69	18 33.3	− 65
15	258 58.3	85 14.7	·· 04.5	272 04.4	·· 31.3	85 16.6	·· 52.3	19 10.2	·· 46.9	150 41.2	69	·18 26.8	− 66
16	274 00.7	100 14.4	03.5	287 06.5	31.0	100 18.6	52.1	34 12.4	46.9	165 07.1	70	18 20.2	− 67
17	289 03.2	115 14.1	02.4	302 08.5	30.6	115 20.6	51.9	49 14.6	47.0	179 33.1	70	18 13.5	− 68
18	304 05.7	130 13.8	+ 4 01.3	317 10.6	− 8 30.3	130 22.7	+ 3 51.8	64 16.8	−18 47.0	193 59.1	71	+18 06.7	− 70
19	319 08.1	145 13.5	4 00.3	332 12.7	29.9	145 24.7	51.6	79 19.0	47.1	208 25.2	71	17 59.7	− 70
20	334 10.6	160 13.2	3 59.2	347 14.8	29.6	160 26.7	51.4	94 21.1	47.2	222 51.3	71	17 52.7	− 72
21	349 13.1	175 12.9	·· 58.1	2 16.9	·· 29.2	175 28.7	·· 51.2	109 23.3	·· 47.2	237 17.4	72	·17 45.5	− 73
22	4 15.5	190 12.6	57.0	17 19.0	28.9	190 30.8	51.0	124 25.5	47.3	251 43.6	73	17 38.2	− 74
23	19 18.0	205 12.3	56.0	32 21.1	28.5	205 32.8	50.8	139 27.7	47.3	266 09.9	73	17 30.8	− 75
26 0	34 20.5	220 12.0	+ 3 54.9	47 23.2	− 8 28.2	220 34.8	+ 3 50.7	154 29.9	−18 47.4	280 36.2	73	+17 23.3	− 76
1	49 22.9	235 11.7	53.8	62 25.2	27.8	235 36.8	50.5	169 32.1	47.5	295 02.5	74	17 15.7	− 77
2	64 25.4	250 11.4	52.7	77 27.3	27.5	250 38.9	50.3	184 34.3	47.5	309 28.9	74	17 08.0	− 79
3	79 27.8	265 11.1	·· 51.7	92 29.4	·· 27.1	265 40.9	·· 50.1	199 36.4	·· 47.6	323 55.3	75	·17 00.1	− 79
4	94 30.3	280 10.8	50.6	107 31.5	26.8	280 42.9	49.9	214 38.6	47.6	338 21.8	75	16 52.2	− 81
5	109 32.8	295 10.5	49.5	122 33.6	26.4	295 45.0	49.8	229 40.8	47.7	352 48.3	76	16 44.1	− 81
6	124 35.2	310 10.2	+ 3 48.4	137 35.6	− 8 26.1	310 47.0	+ 3 49.6	244 43.0	−18 47.8	7 14.9	76	+16 36.0	− 83
7	139 37.7	325 09.9	47.4	152 37.7	25.7	325 49.0	49.4	259 45.2	47.8	21 41.5	77	16 27.7	− 83
8	154 40.2	340 09.6	46.3	167 39.8	25.4	340 51.0	49.2	274 47.4	47.9	36 08.2	77	16 19.4	− 85
9	169 42.6	355 09.3	·· 45.2	182 41.9	·· 25.0	355 53.1	·· 49.0	289 49.5	·· 47.9	50 34.9	77	·16 10.9	− 85
10	184 45.1	10 08.9	44.1	197 43.9	24.6	10 55.1	48.9	304 51.7	48.0	65 01.6	78	16 02.4	− 87
11	199 47.6	25 08.6	43.1	212 46.0	24.3	25 57.1	48.7	319 53.9	48.1	79 28.4	79	15 53.7	− 87
12	214 50.0	40 08.3	+ 3 42.0	227 48.1	− 8 23.9	40 59.2	+ 3 48.5	334 56.1	−18 48.1	93 55.3	79	+15 45.0	− 89
13	229 52.5	55 08.0	40.9	242 50.2	23.6	56 01.2	48.3	349 58.3	48.2	108 22.2	80	15 36.1	− 89
14	244 55.0	70 07.7	39.8	257 52.2	23.2	71 03.2	48.1	5 00.5	48.2	122 49.2	80	15 27.2	− 91
15	259 57.4	85 07.4	·· 38.8	272 54.3	·· 22.9	86 05.2	·· 48.0	20 02.6	·· 48.3	137 16.2	80	·15 18.1	− 91
16	274 59.9	100 07.1	37.7	287 56.4	22.5	101 07.3	47.8	35 04.8	48.4	151 43.2	81	15 09.0	− 92
17	290 02.3	115 06.8	36.6	302 58.4	22.2	116 09.3	47.6	50 07.0	48.4	166 10.3	82	14 59.8	− 93
18	305 04.8	130 06.5	+ 3 35.5	318 00.5	− 8 21.8	131 11.3	+ 3 47.4	65 09.2	−18 48.5	180 37.5	82	+14 50.5	− 94
19	320 07.3	145 06.2	34.4	333 02.6	21.4	146 13.4	47.2	80 11.4	48.5	195 04.7	82	14 41.1	− 95
20	335 09.7	160 05.9	33.4	348 04.6	21.1	161 15.4	47.0	95 13.6	48.6	209 31.9	83	14 31.6	− 96
21	350 12.2	175 05.6	·· 32.3	3 06.7	·· 20.7	176 17.4	·· 46.9	110 15.7	·· 48.7	223 59.2	84	·14 22.0	− 97
22	5 14.7	190 05.3	31.2	18 08.7	20.4	191 19.4	46.7	125 17.9	48.7	238 26.6	84	14 12.3	− 97
23	20 17.1	205 05.0	30.1	33 10.8	20.0	206 21.5	46.5	140 20.1	48.8	252 54.0	84	14 02.6	− 99
24	35 19.6	220 04.7	+ 3 29.0	48 12.9	− 8 19.6	221 23.5	+ 3 46.3	155 22.3	−18 48.8	267 21.4	85	+13 52.7	− 99
code	—	− 3	− 10	+ 21	+ 4	+ 20	− 1	+ 22	− 1				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
24 0	183 55.7	−11 40.2
1	198 55.8	41.0
2	213 55.9	41.9
3	228 55.9	42.8
4	243 56.0	43.6
5	258 56.1	44.5
6	273 56.2	−11 45.4
7	288 56.3	46.3
8	303 56.3	47.1
9	318 56.4	48.0
10	333 56.5	48.9
11	348 56.6	49.7
12	3 56.7	−11 50.6
13	18 56.7	51.5
14	33 56.8	52.3
15	48 56.9	53.2
16	63 57.0	54.1
17	78 57.0	54.9
18	93 57.1	−11 55.8
19	108 57.2	56.7
20	123 57.3	57.5
21	138 57.3	58.4
22	153 57.4	11 59.3
23	168 57.5	12 00.1
25 0	183 57.6	−12 01.0
1	198 57.6	01.9
2	213 57.7	02.7
3	228 57.8	03.6
4	243 57.9	04.4
5	258 57.9	05.3
6	273 58.0	−12 06.2
7	288 58.1	07.0
8	303 58.1	07.9
9	318 58.2	08.8
10	333 58.3	09.6
11	348 58.4	10.5
12	3 58.4	−12 11.3
13	18 58.5	12.2
14	33 58.6	13.1
15	48 58.6	13.9
16	63 58.7	14.8
17	78 58.8	15.6
18	93 58.8	−12 16.5
19	108 58.9	17.3
20	123 59.0	18.2
21	138 59.0	19.1
22	153 59.1	19.9
23	168 59.2	20.8
26 0	183 59.2	−12 21.6
1	198 59.3	22.5
2	213 59.4	23.3
3	228 59.4	24.2
4	243 59.5	25.1
5	258 59.6	25.9
6	273 59.6	−12 26.8
7	288 59.7	27.6
8	303 59.8	28.5
9	318 59.8	29.3
10	333 59.9	30.2
11	349 00.0	31.0
12	4 00.0	−12 31.9
13	19 00.1	32.7
14	34 00.1	33.6
15	49 00.2	34.4
16	64 00.3	35.3
17	79 00.3	36.1
18	94 00.4	−12 37.0
19	109 00.4	37.8
20	124 00.5	38.7
21	139 00.6	39.5
22	154 00.6	40.4
23	169 00.7	41.2
24	184 00.7	−12 42.1
code	—	− 9

No.	Name	STARS SHA	STARS Dec.
		° ′	° ′
7	Acamar	315 50.1	−40 28.5
5	Achernar	335 57.7	−57 27.3
30	Acrux	173 57.5	−62 51.5
19	Adhara	255 45.8	−28 54.6
10	Aldebaran	291 37.9	+16 25.5
32	Alioth	166 58.4	+56 11.5
34	Alkaid	153 32.8	+49 31.7
55	Al Na'ir	28 36.8	−47 10.3
15	Alnilam	276 29.3	− 1 13.6
25	Alphard	218 37.9	− 8 28.2
41	Alphecca	126 47.3	+26 51.7
1	Alpheratz	358 27.2	+28 51.4
51	Altair	62 49.7	+ 8 45.4
2	Ankaa	353 57.2	−42 32.3
42	Antares	113 18.7	−26 20.2
37	Arcturus	146 34.8	+19 24.5
43	Atria	108 59.1	−68 57.2
22	Avior	234 35.4	−59 22.0
13	Bellatrix	279 17.4	+ 6 18.8
16	Betelg'se	271 47.1	+ 7 24.1
17	Canopus	264 14.8	−52 40.1
12	Capella	281 36.9	+45 57.2
53	Deneb	50 00.4	+45 07.9
28	Denebola	183 17.2	+14 48.8
4	Diphda	349 38.2	−18 13.2
27	Dubhe	194 44.2	+61 58.8
14	Elnath	279 06.1	+28 34.3
47	Eltanin	91 06.2	+51 29.9
54	Enif	34 28.7	+ 9 40.9
56	Fomalhaut	16 10.5	−29 51.0
31	Gacrux	172 48.8	−56 52.2
29	Gienah	176 36.3	−17 18.1
35	Hadar	149 48.9	−60 09.9
6	Hamal	328 48.4	+23 15.7
48	Kaus Aust.	84 40.3	−34 24.4
40	Kochab	137 19.3	+74 20.0
57	Markab	14 20.4	+14 58.6
8	Menkar	314 59.2	+ 3 55.4
36	Menkent	148 58.1	−36 09.4
24	Miapl'dus	221 49.0	−69 32.1
9	Mirfak	309 40.8	+49 42.6
50	Nunki	76 51.1	−26 21.1
52	Peacock	54 26.1	−56 52.6
21	Pollux	244 19.6	+28 07.8
20	Procyon	245 44.1	+ 5 20.2
46	R'alhague	96 46.1	+12 35.6
26	Regulus	208 28.8	+12 10.7
11	Rigel	281 52.7	− 8 14.9
38	Rigil Kent.	140 50.5	−60 39.5
44	Sabik	103 01.5	−15 40.3
3	Schedar	350 28.5	+56 18.3
45	Shaula	97 19.9	−37 04.4
18	Sirius	259 11.0	−16 39.2
33	Spica	159 16.4	−10 56.1
23	Suhail	223 23.8	−43 15.3
49	Vega	81 07.9	+38 44.9
39	Zub'g'bi	137 52.8	−15 51.7

GMT	Equation of Time (App.—Mean) 24	25	26
h	m s	m s	m s
0	+15 42.6	+15 50.1	+15 56.9
6	+15 44.6	+15 51.9	+15 58.4
12	+15 46.5	+15 53.6	+15 59.9
18	+15 48.3	+15 55.2	+16 01.4
24	+15 50.1	+15 56.9	+16 02.8

Lat. N °	Sunrise	Twlt. begins	Moonrise 24	25	26	27
	h m	h m	h m	h m	h m	h m
72	8 16	4 16	▭	▭	20 37	22 54
70	7 57	4 23	▭	18 57	21 09	23 10
68	7 42	4 28	17 48	19 38	21 31	23 22
66	7 30	4 33	18 29	20 06	21 49	23 32
64	7 20	4 36	18 57	20 27	22 03	23 41
62	7 12	4 40	19 19	20 44	22 15	23 48
60	7 04	4 42	19 36	20 58	22 25	23 55
58	6 58	4 44	19 51	21 10	22 34	24 00
56	6 52	4 45	20 04	21 20	22 42	24 05
54	6 47	4 46	20 14	21 29	22 48	24 10
52	6 42	4 48	20 24	21 37	22 55	24 14
50	6 38	4 48	20 33	21 44	23 00	24 17
45	6 29	4 50	20 51	22 00	23 12	24 25
40	6 21	4 49	21 06	22 13	23 22	24 31
35	6 14	4 49	21 18	22 24	23 30	24 37
30	6 09	4 48	21 29	22 33	23 38	24 42
20	5 58	4 44	21 48	22 49	23 50	24 50
10	5 49	4 38	22 04	23 03	24 01	0 01
0	5 41	4 31	22 20	23 17	24 12	0 12
10	5 32	4 20	22 35	23 30	24 22	0 22
20	5 23	4 07	22 51	23 44	24 33	0 33
30	5 12	3 48	23 10	24 00	0 00	0 46
35	5 05	3 35	23 21	24 09	0 09	0 53
40	4 58	3 20	23 34	24 20	0 20	1 01
45	4 50	3 00	23 48	24 33	0 33	1 10
50	4 39	2 32	24 06	0 06	0 48	1 22
52	4 35	2 19	24 15	0 15	0 55	1 27
54	4 29	2 00	24 24	0 24	1 02	1 33
56	4 23	1 39	24 35	0 35	1 11	1 40
58	4 17	1 07	0 01	0 47	1 21	1 47
60	4 09	////	0 17	1 01	1 32	1 55

Lat. N °	Sunset	Twlt. ends	Moonset 24	25	26	27
	h m	h m	h m	h m	h m	h m
72	15 11	19 06	▭	▭	15 36	15 11
70	15 30	19 00	▭	15 18	15 03	14 53
68	15 44	18 54	14 28	14 37	14 39	14 39
66	15 57	18 51	13 46	14 08	14 20	14 27
64	16 07	18 48	13 17	13 47	14 05	14 17
62	16 15	18 45	12 55	13 29	13 52	14 09
60	16 23	18 43	12 37	13 15	13 41	14 01
58	16 29	18 41	12 23	13 02	13 32	13 55
56	16 35	18 40	12 10	12 51	13 24	13 49
54	16 40	18 39	11 59	12 42	13 16	13 44
52	16 45	18 38	11 49	12 33	13 09	13 39
50	16 49	18 37	11 40	12 26	13 03	13 35
45	16 59	18 37	11 21	12 09	12 50	13 26
40	17 06	18 37	11 06	11 56	12 39	13 18
35	17 13	18 38	10 53	11 44	12 30	13 11
30	17 19	18 39	10 42	11 34	12 22	13 05
20	17 30	18 44	10 22	11 17	12 07	12 55
10	17 39	18 50	10 05	11 01	11 55	12 46
0	17 47	18 57	9 49	10 47	11 43	12 37
10	17 56	19 08	9 34	10 33	11 31	12 28
20	18 06	19 22	9 16	10 17	11 18	12 19
30	18 17	19 42	8 57	9 59	11 04	12 08
35	18 23	19 54	8 45	9 49	10 55	12 02
40	18 31	20 11	8 32	9 37	10 45	11 55
45	18 39	20 31	8 16	9 23	10 34	11 47
50	18 50	21 00	7 57	9 05	10 20	11 36
52	18 55	21 15	7 48	8 57	10 13	11 32
54	19 00	21 32	7 37	8 48	10 06	11 27
56	19 06	21 56	7 26	8 38	9 58	11 21
58	19 13	22 30	7 12	8 26	9 48	11 14
60	19 20	////	6 56	8 12	9 38	11 07

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
24	3 36	9 18	20 54	9 23	13 47
25	4 33	9 19	20 51	9 20	13 44
26	5 30	9 19	20 48	9 16	13 40
27	6 24	9 20	20 44	9 13	13 37

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.4	0.1	0.3
30	0.4	0.1	0.2
45	0.4	0.1	0.2
60	0.4	0.1	0.1
75	0.4	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	24	25	26
°	′	′	′
0	18.1	18.2	18.3
4	18.1	18.2	18.3
8	18.1	18.2	18.3
12	18.0	18.2	18.3
16	18.0	18.1	18.2
20	18.0	18.1	18.2
24	17.9	18.0	18.1
28	17.8	17.9	18.1
32	17.8	17.9	18.0
36	17.7	17.8	17.9
40	17.6	17.7	17.8
44	17.5	17.6	17.7
48	17.4	17.5	17.6
52	17.3	17.4	17.4
56	17.2	17.2	17.3
60	17.0	17.1	17.2
64	16.9	17.0	17.0
68	16.8	16.8	16.9
72	16.6	16.7	16.8
76	16.5	16.6	16.6
80	16.4	16.4	16.5
84	16.2	16.3	16.3
88	16.1	16.2	16.2
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	24	25	26
°	′	′	′
0	14.1	14.0	14.0
4	14.1	14.0	14.0
8	14.1	14.1	14.0
12	14.2	14.1	14.0
16	14.2	14.1	14.1
20	14.2	14.2	14.1
24	14.3	14.2	14.2
28	14.4	14.3	14.2
32	14.4	14.4	14.3
36	14.5	14.5	14.4
40	14.6	14.6	14.5
44	14.7	14.7	14.6
48	14.8	14.8	14.7
52	14.9	14.9	14.9
56	15.0	15.0	15.0
60	15.2	15.1	15.1
64	15.3	15.3	15.3
68	15.4	15.4	15.4
72	15.5	15.5	15.5
76	15.7	15.7	15.7
80	15.8	15.8	15.8
84	16.0	16.0	16.0
88	16.1	16.1	16.1
90			

Subtract from table, back cover

Last Quarter 26

G M T	♈ GHA	VENUS −3.6 GHA	Dec.	MARS −1.4 GHA	Dec.	JUPITER −1.3 GHA	Dec.	SATURN 0.8 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
27 0	35 19.6	220 04.7	+ 3 29.0	48 12.9	− 8 19.6	221 23.5	+ 3 46.3	155 22.3	−18 48.8	267 21.4	85	+13 52.7	− 99
1	50 22.1	235 04.4	28.0	63 14.9	19.3	236 25.5	46.1	170 24.5	48.9	281 48.9	86	13 42.8	−100
2	65 24.5	250 04.1	26.9	78 17.0	18.9	251 27.6	46.0	185 26.7	48.9	296 16.5	86	13 32.8	−101
3	80 27.0	265 03.8	·· 25.8	93 19.0	·· 18.6	266 29.6	·· 45.8	200 28.8	·· 49.0	310 44.1	86	·13 22.7	−101
4	95 29.5	280 03.5	24.7	108 21.1	18.2	281 31.6	45.6	215 31.0	49.1	325 11.7	87	13 12.6	−103
5	110 31.9	295 03.2	23.6	123 23.1	17.8	296 33.6	45.4	230 33.2	49.1	339 39.4	87	13 02.3	−103
6	125 34.4	310 02.8	+ 3 22.6	138 25.2	− 8 17.5	311 35.7	+ 3 45.2	245 35.4	−18 49.2	354 07.1	88	+12 52.0	−104
7	140 36.8	325 02.5	21.5	153 27.2	17.1	326 37.7	45.1	260 37.6	49.2	8 34.9	88	12 41.6	−105
8	155 39.3	340 02.2	20.4	168 29.3	16.8	341 39.7	44.9	275 39.7	49.3	23 02.7	89	12 31.1	−105
9	170 41.8	355 01.9	·· 19.3	183 31.3	·· 16.4	356 41.8	·· 44.7	290 41.9	·· 49.4	37 30.6	89	·12 20.6	−106
10	185 44.2	10 01.6	18.2	198 33.4	16.0	11 43.8	44.5	305 44.1	49.4	51 58.5	90	12 10.0	−107
11	200 46.7	25 01.3	17.1	213 35.4	15.7	26 45.8	44.3	320 46.3	49.5	66 26.5	90	11 59.3	−108
12	215 49.2	40 01.0	+ 3 16.1	228 37.5	− 8 15.3	41 47.9	+ 3 44.2	335 48.5	−18 49.5	80 54.5	91	+11 48.5	−108
13	230 51.6	55 00.7	15.0	243 39.5	14.9	56 49.9	44.0	350 50.7	49.6	95 22.6	91	11 37.7	−109
14	245 54.1	70 00.4	13.9	258 41.6	14.6	71 51.9	43.8	5 52.8	49.7	109 50.7	91	11 26.8	−110
15	260 56.6	85 00.1	·· 12.8	273 43.6	·· 14.2	86 54.0	·· 43.6	20 55.0	·· 49.7	124 18.8	92	·11 15.8	−110
16	275 59.0	99 59.8	11.7	288 45.6	13.9	101 56.0	43.4	35 57.2	49.8	138 47.0	93	11 04.8	−111
17	291 01.5	114 59.5	10.6	303 47.7	13.5	116 58.0	43.3	50 59.4	49.8	153 15.3	92	10 53.7	−112
18	306 04.0	129 59.2	+ 3 09.5	318 49.7	− 8 13.1	132 00.0	+ 3 43.1	66 01.6	−18 49.9	167 43.5	94	+10 42.5	−112
19	321 06.4	144 58.9	08.5	333 51.8	12.8	147 02.1	42.9	81 03.7	50.0	182 11.9	93	10 31.3	−113
20	336 08.9	159 58.6	07.4	348 53.8	12.4	162 04.1	42.7	96 05.9	50.0	196 40.2	94	10 20.0	−113
21	351 11.3	174 58.3	·· 06.3	3 55.8	·· 12.0	177 06.1	·· 42.6	111 08.1	·· 50.1	211 08.6	95	·10 08.7	−114
22	6 13.8	189 57.9	05.2	18 57.9	11.7	192 08.2	42.4	126 10.3	50.1	225 37.1	95	9 57.3	−114
23	21 16.3	204 57.6	04.1	33 59.9	11.3	207 10.2	42.2	141 12.5	50.2	240 05.6	95	9 45.9	−116
28 0	36 18.7	219 57.3	+ 3 03.0	49 01.9	− 8 10.9	222 12.2	+ 3 42.0	156 14.7	−18 50.3	254 34.1	96	+ 9 34.3	−115
1	51 21.2	234 57.0	01.9	64 04.0	10.6	237 14.3	41.8	171 16.8	50.3	269 02.7	96	9 22.8	−116
2	66 23.7	249 56.7	3 00.8	79 06.0	10.2	252 16.3	41.7	186 19.0	50.4	283 31.3	96	9 11.2	−117
3	81 26.1	264 56.4	· 2 59.8	94 08.0	·· 09.8	267 18.3	·· 41.5	201 21.2	·· 50.4	297 59.9	97	· 8 59.5	−117
4	96 28.6	279 56.1	58.7	109 10.1	09.4	282 20.4	41.3	216 23.4	50.5	312 28.6	97	8 47.8	−118
5	111 31.1	294 55.8	57.6	124 12.1	09.1	297 22.4	41.1	231 25.6	50.6	326 57.3	98	8 36.0	−118
6	126 33.5	309 55.5	+ 2 56.5	139 14.1	− 8 08.7	312 24.4	+ 3 40.9	246 27.7	−18 50.6	341 26.1	98	+ 8 24.2	−119
7	141 36.0	324 55.2	55.4	154 16.1	08.3	327 26.5	40.8	261 29.9	50.7	355 54.9	98	8 12.3	−119
8	156 38.4	339 54.9	54.3	169 18.2	08.0	342 28.5	40.6	276 32.1	50.7	10 23.7	99	8 00.4	−119
9	171 40.9	354 54.6	·· 53.2	184 20.2	·· 07.6	357 30.5	·· 40.4	291 34.3	·· 50.8	24 52.6	99	· 7 48.5	−120
10	186 43.4	9 54.3	52.1	199 22.2	07.2	12 32.6	40.2	306 36.5	50.8	39 21.5	99	7 36.5	−121
11	201 45.8	24 54.0	51.0	214 24.2	06.9	27 34.6	40.0	321 38.6	50.9	53 50.4	100	7 24.4	−120
12	216 48.3	39 53.6	+ 2 49.9	229 26.2	− 8 06.5	42 36.6	+ 3 39.9	336 40.8	−18 51.0	68 19.4	100	+ 7 12.4	−121
13	231 50.8	54 53.3	48.9	244 28.3	06.1	57 38.7	39.7	351 43.0	51.0	82 48.4	100	7 00.3	−122
14	246 53.2	69 53.0	47.8	259 30.3	05.7	72 40.7	39.5	6 45.2	51.1	97 17.4	101	6 48.1	−122
15	261 55.7	84 52.7	·· 46.7	274 32.3	·· 05.4	87 42.7	·· 39.3	21 47.4	·· 51.1	111 46.5	101	· 6 35.9	−122
16	276 58.2	99 52.4	45.6	289 34.3	05.0	102 44.8	39.2	36 49.5	51.2	126 15.6	101	6 23.7	−123
17	292 00.6	114 52.1	44.5	304 36.3	04.6	117 46.8	39.0	51 51.7	51.3	140 44.7	102	6 11.4	−123
18	307 03.1	129 51.8	+ 2 43.4	319 38.3	− 8 04.2	132 48.8	+ 3 38.8	66 53.9	−18 51.3	155 13.9	101	+ 5 59.1	−123
19	322 05.6	144 51.5	42.3	334 40.3	03.9	147 50.9	38.6	81 56.1	51.4	169 43.0	103	5 46.8	−124
20	337 08.0	159 51.2	41.2	349 42.4	03.5	162 52.9	38.4	96 58.3	51.4	184 12.3	102	5 34.4	−124
21	352 10.5	174 50.9	·· 40.1	4 44.4	·· 03.1	177 54.9	·· 38.3	112 00.4	·· 51.5	198 41.5	103	· 5 22.0	−124
22	7 12.9	189 50.6	39.0	19 46.4	02.7	192 57.0	38.1	127 02.6	51.6	213 10.8	103	5 09.6	−124
23	22 15.4	204 50.3	37.9	34 48.4	02.4	207 59.0	37.9	142 04.8	51.6	227 40.1	103	4 57.2	−125
29 0	37 17.9	219 50.0	+ 2 36.8	49 50.4	− 8 02.0	223 01.0	+ 3 37.7	157 07.0	−18 51.7	242 09.4	103	+ 4 44.7	−125
1	52 20.3	234 49.6	35.7	64 52.4	01.6	238 03.1	37.6	172 09.2	51.7	256 38.7	104	4 32.2	−125
2	67 22.8	249 49.3	34.6	79 54.4	01.2	253 05.1	37.4	187 11.3	51.8	271 08.1	104	4 19.7	−125
3	82 25.3	264 49.0	·· 33.5	94 56.4	·· 00.9	268 07.1	·· 37.2	202 13.5	·· 51.9	285 37.5	104	· 4 07.2	−126
4	97 27.7	279 48.7	32.5	109 58.4	00.5	283 09.2	37.0	217 15.7	51.9	300 06.9	104	3 54.6	−126
5	112 30.2	294 48.4	31.4	125 00.4	8 00.1	298 11.2	36.8	232 17.9	52.0	314 36.3	105	3 42.0	−126
6	127 32.7	309 48.1	+ 2 30.3	140 02.4	− 7 59.7	313 13.2	+ 3 36.7	247 20.0	−18 52.0	329 05.8	105	+ 3 29.4	−126
7	142 35.1	324 47.8	29.2	155 04.4	59.3	328 15.3	36.5	262 22.2	52.1	343 35.3	104	3 16.8	−126
8	157 37.6	339 47.5	28.1	170 06.4	59.0	343 17.3	36.3	277 24.4	52.2	358 04.7	106	3 04.2	−127
9	172 40.0	354 47.2	·· 27.0	185 08.4	·· 58.6	358 19.4	·· 36.1	292 26.6	·· 52.2	12 34.3	105	· 2 51.5	−126
10	187 42.5	9 46.9	25.9	200 10.4	58.2	13 21.4	36.0	307 28.8	52.3	27 03.8	105	2 38.9	−127
11	202 45.0	24 46.6	24.8	215 12.4	57.8	28 23.4	35.8	322 30.9	52.3	41 33.3	106	2 26.2	−127
12	217 47.4	39 46.3	+ 2 23.7	230 14.4	− 7 57.4	43 25.5	+ 3 35.6	337 33.1	−18 52.4	56 02.9	106	+ 2 13.5	−126
13	232 49.9	54 46.0	22.6	245 16.4	57.1	58 27.5	35.4	352 35.3	52.4	70 32.5	106	2 00.9	−127
14	247 52.4	69 45.6	21.5	260 18.4	56.7	73 29.5	35.2	7 37.5	52.5	85 02.1	106	1 48.2	−128
15	262 54.8	84 45.3	·· 20.4	275 20.4	·· 56.3	88 31.6	·· 35.1	22 39.7	·· 52.6	99 31.7	106	· 1 35.4	−127
16	277 57.3	99 45.0	19.3	290 22.4	55.9	103 33.6	34.9	37 41.8	52.6	114 01.3	107	1 22.7	−127
17	292 59.8	114 44.7	18.2	305 24.4	55.5	118 35.6	34.7	52 44.0	52.7	128 31.0	106	1 10.0	−127
18	308 02.2	129 44.4	+ 2 17.1	320 26.3	− 7 55.2	133 37.7	+ 3 34.5	67 46.2	−18 52.7	143 00.6	107	+ 0 57.3	−127
19	323 04.7	144 44.1	16.0	335 28.3	54.8	148 39.7	34.4	82 48.4	52.8	157 30.3	107	0 44.6	−127
20	338 07.2	159 43.8	14.9	350 30.3	54.4	163 41.8	34.2	97 50.5	52.9	172 00.0	107	0 31.9	−128
21	353 09.6	174 43.5	·· 13.8	5 32.3	·· 54.0	178 43.8	·· 34.0	112 52.7	·· 52.9	186 29.7	107	· 0 19.1	−127
22	8 12.1	189 43.2	12.7	20 34.3	53.6	193 45.8	33.8	127 54.9	53.0	200 59.4	107	+ 0 06.4	−127
23	23 14.5	204 42.9	11.6	35 36.3	53.2	208 47.9	33.7	142 57.1	53.0	215 29.1	107	− 0 06.3	−127
24	38 17.0	219 42.6	+ 2 10.5	50 38.3	− 7 52.9	223 49.9	+ 3 33.5	157 59.3	−18 53.1	229 58.8	107	− 0 19.0	−127
code	−	− 3	− 10	+ 21	+ 4	+ 21	− 2	+ 22	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
27 0	184 00.7	−12 42.1	7	Acamar	315 50.1	−40 28.5
1	199 00.8	42.9	5	Achernar	335 57.7	−57 27.3
2	214 00.9	43.8	30	Acrux	173 57.5	−62 51.5
3	229 00.9	·· 44.6	19	Adhara	255 45.8	−28 54.6
4	244 01.0	45.5	10	Aldebaran	291 37.9	+16 25.5
5	259 01.0	46.3				
6	274 01.1	−12 47.2	32	Alioth	166 58.4	+56 11.5
7	289 01.1	48.0	34	Alkaid	153 32.8	+49 31.7
8	304 01.2	48.9	55	Al Na'ir	28 36.8	−47 10.3
9	319 01.2	·· 49.7	15	Alnilam	276 29.3	− 1 13.6
10	334 01.3	50.6	25	Alphard	218 37.9	− 8 28.2
11	349 01.4	51.4				
12	4 01.4	−12 52.2	41	Alphecca	126 47.3	+26 51.7
13	19 01.5	53.1	1	Alpheratz	358 27.2	+28 51.4
14	34 01.5	53.9	51	Altair	62 49.7	+ 8 45.4
15	49 01.6	·· 54.8	2	Ankaa	353 57.2	−42 32.4
16	64 01.6	55.6	42	Antares	113 18.7	−26 20.2
17	79 01.7	56.5				
18	94 01.7	−12 57.3	37	Arcturus	146 34.8	+19 24.5
19	109 01.8	58.1	43	Atria	108 59.1	−68 57.2
20	124 01.8	59.0	22	Avior	234 35.4	−59 22.0
21	139 01.9	·12 59.8	13	Bellatrix	279 17.3	+ 6 18.8
22	154 01.9	13 00.7	16	Betelg'se	271 47.1	+ 7 24.0
23	169 02.0	01.5				
			17	Canopus	264 14.7	−52 40.1
28 0	184 02.0	−13 02.3	12	Capella	281 36.9	+45 57.3
1	199 02.1	03.2	53	Deneb	50 00.4	+45 07.9
2	214 02.1	04.0	28	Denebola	183 17.2	+14 48.8
3	229 02.2	·· 04.9	4	Diphda	349 38.2	−18 13.3
4	244 02.2	05.7				
5	259 02.3	06.5	27	Dubhe	194 44.1	+61 58.8
6	274 02.3	−13 07.4	14	Elnath	279 06.1	+28 34.3
7	289 02.4	08.2	47	Eltanin	91 06.2	+51 29.9
8	304 02.4	09.1	54	Enif	34 28.7	+ 9 40.9
9	319 02.5	·· 09.9	56	Fomalhaut	16 10.6	−29 51.0
10	334 02.5	10.7				
11	349 02.6	11.6	31	Gacrux	172 48.8	−56 52.2
12	4 02.6	−13 12.4	29	Gienah	176 36.3	−17 18.1
13	19 02.7	13.2	35	Hadar	149 48.9	−60 09.9
14	34 02.7	14.1	6	Hamal	328 48.4	+23 15.7
15	49 02.8	·· 14.9	48	Kaus Aust.	84 40.3	−34 24.4
16	64 02.8	15.7				
17	79 02.8	16.6	40	Kochab	137 19.3	+74 20.0
18	94 02.9	−13 17.4	57	Markab	14 20.4	+14 58.6
19	109 02.9	18.2	8	Menkar	314 59.2	+ 3 55.4
20	124 03.0	19.1	36	Menkent	148 58.1	−36 09.4
21	139 03.0	·· 19.9	24	Miapl'dus	221 48.9	−69 32.1
22	154 03.1	20.7				
23	169 03.1	21.6	9	Mirfak	309 40.7	+49 42.6
			50	Nunki	76 51.1	−26 21.1
29 0	184 03.1	−13 22.4	52	Peacock	54 26.1	−56 52.6
1	199 03.2	23.2	21	Pollux	244 19.5	+28 07.8
2	214 03.2	24.1	20	Procyon	245 44.1	+ 5 20.2
3	229 03.3	·· 24.9				
4	244 03.3	25.7	46	R'alhague	96 46.1	+12 35.6
5	259 03.4	26.6	26	Regulus	208 28.8	+12 10.7
6	274 03.4	−13 27.4	11	Rigel	281 52.6	− 8 14.9
7	289 03.4	28.2	38	Rigil Kent.	140 50.5	−60 39.5
8	304 03.5	29.0	44	Sabik	103 01.5	−15 40.3
9	319 03.5	·· 29.9				
10	334 03.6	30.7	3	Schedar	350 28.5	+56 18.3
11	349 03.6	31.5	45	Shaula	97 19.9	−37 04.4
12	4 03.6	−13 32.3	18	Sirius	259 11.0	−16 39.2
13	19 03.7	33.2	33	Spica	159 16.4	−10 56.1
14	34 03.7	34.0	23	Suhail	223 23.8	−43 15.3
15	49 03.7	·· 34.8				
16	64 03.8	35.7	49	Vega	81 07.9	+38 44.9
17	79 03.8	36.5	39	Zub'g'bi	137 52.8	−15 51.7
18	94 03.9	−13 37.3				
19	109 03.9	38.1				
20	124 03.9	39.0				
21	139 04.0	·· 39.8				
22	154 04.0	40.6				
23	169 04.0	41.4				
24	184 04.1	−13 42.2				
code	—	− 8				

Lat.	Sunrise	Twlt. begins	Moonrise 27	28	29	30
N °	h m	h m	h m	h m	h m	h m
72	8 33	4 29	22 54	24 59	0 59	3 00
70	8 11	4 34	23 10	25 05	1 05	2 58
68	7 54	4 38	23 22	25 11	1 11	2 57
66	7 41	4 42	23 32	25 15	1 15	2 56
64	7 30	4 44	23 41	25 19	1 19	2 55
62	7 20	4 46	23 48	25 22	1 22	2 54
60	7 12	4 48	23 55	25 25	1 25	2 54
58	7 05	4 49	24 00	0 00	1 27	2 53
56	6 58	4 51	24 05	0 05	1 29	2 52
54	6 53	4 52	24 10	0 10	1 31	2 52
52	6 48	4 52	24 14	0 14	1 33	2 52
50	6 43	4 52	24 17	0 17	1 34	2 51
45	6 33	4 53	24 25	0 25	1 38	2 50
40	6 25	4 52	24 31	0 31	1 41	2 50
35	6 17	4 51	24 37	0 37	1 43	2 49
30	6 11	4 49	24 42	0 42	1 46	2 49
20	6 00	4 45	24 50	0 50	1 49	2 48
10	5 50	4 39	0 01	0 58	1 53	2 47
0	5 40	4 30	0 12	1 05	1 56	2 46
10	5 31	4 19	0 22	1 12	1 59	2 46
20	5 21	4 04	0 33	1 19	2 03	2 45
30	5 09	3 45	0 46	1 27	2 06	2 44
35	5 02	3 31	0 53	1 32	2 09	2 44
40	4 54	3 14	1 01	1 37	2 11	2 43
45	4 45	2 53	1 10	1 44	2 14	2 43
50	4 34	2 24	1 22	1 51	2 17	2 42
52	4 29	2 09	1 27	1 55	2 19	2 42
54	4 23	1 49	1 33	1 59	2 21	2 42
56	4 16	1 23	1 40	2 03	2 23	2 41
58	4 09	0 42	1 47	2 07	2 25	2 41
60	4 01	////	1 55	2 13	2 27	2 41
S						

Lat.	Sunset	Twlt. ends	Moonset 27	28	29	30
N °	h m	h m	h m	h m	h m	h m
72	14 53	18 53	15 11	14 54	14 40	14 26
70	15 15	18 48	14 53	14 45	14 38	14 30
68	15 32	18 45	14 39	14 38	14 36	14 34
66	15 46	18 42	14 27	14 32	14 35	14 38
64	15 57	18 39	14 17	14 26	14 33	14 40
62	16 06	18 37	14 09	14 22	14 32	14 43
60	16 15	18 36	14 01	14 17	14 31	14 45
58	16 22	18 35	13 55	14 14	14 31	14 47
56	16 28	18 34	13 49	14 11	14 30	14 48
54	16 34	18 33	13 44	14 08	14 29	14 50
52	16 39	18 33	13 39	14 05	14 29	14 51
50	16 44	18 33	13 35	14 03	14 28	14 53
45	16 54	18 33	13 26	13 57	14 27	14 56
40	17 03	18 34	13 18	13 53	14 26	14 58
35	17 10	18 35	13 11	13 49	14 25	15 00
30	17 16	18 37	13 05	13 46	14 24	15 02
20	17 28	18 42	12 55	13 40	14 22	15 05
10	17 38	18 49	12 46	13 34	14 21	15 08
0	17 47	18 58	12 37	13 29	14 20	15 10
10	17 57	19 09	12 28	13 24	14 19	15 13
20	18 07	19 24	12 19	13 19	14 17	15 15
30	18 19	19 45	12 08	13 12	14 16	15 19
35	18 26	19 58	12 02	13 09	14 15	15 20
40	18 34	20 15	11 55	13 05	14 14	15 22
45	18 44	20 38	11 47	13 00	14 12	15 25
50	18 55	21 08	11 36	12 54	14 11	15 27
52	19 00	21 24	11 32	12 51	14 10	15 29
54	19 06	21 44	11 27	12 48	14 09	15 30
56	19 13	22 12	11 21	12 45	14 08	15 32
58	19 20	22 57	11 14	12 41	14 07	15 33
60	19 28	////	11 07	12 37	14 06	15 35
S						

GMT	Equation of Time (App. −Mean) 27	28	29
h	m s	m s	m s
0	+16 02.8	+16 08.1	+16 12.5
6	+16 04.2	+16 09.2	+16 13.5
12	+16 05.5	+16 10.4	+16 14.4
18	+16 06.8	+16 11.5	+16 15.3
24	+16 08.1	+16 12.5	+16 16.2

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
27	6 24	9 20	20 44	9 13	13 37
28	7 17	9 20	20 41	9 10	13 33
29	8 08	9 21	20 38	9 07	13 30
30	8 58	9 21	20 35	9 03	13 26

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb **Add**	Venus **Add**	Mars **Add**
°	′	′	′
0	0.4	0.1	0.3
30	0.4	0.1	0.2
45	0.4	0.1	0.2
60	0.4	0.1	0.1
75	0.4	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	27	28	29
°	′	′	′
0	18.5	18.3	18.1
4	18.5	18.3	18.1
8	18.4	18.3	18.1
12	18.4	18.3	18.0
16	18.4	18.2	18.0
20	18.3	18.2	18.0
24	18.2	18.1	17.9
28	18.2	18.1	17.8
32	18.1	18.0	17.8
36	18.0	17.9	17.7
40	17.9	17.8	17.6
44	17.8	17.7	17.5
48	17.7	17.6	17.4
52	17.5	17.4	17.3
56	17.4	17.3	17.2
60	17.3	17.2	17.0
64	17.1	17.0	16.9
68	17.0	16.9	16.8
72	16.8	16.8	16.6
76	16.7	16.6	16.5
80	16.5	16.5	16.4
84	16.3	16.3	16.2
88	16.2	16.2	16.1
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	27	28	29
°	′	′	′
0	13.9	14.0	14.1
4	13.9	14.0	14.1
8	13.9	14.0	14.1
12	13.9	14.0	14.2
16	14.0	14.1	14.2
20	14.0	14.1	14.2
24	14.1	14.2	14.3
28	14.2	14.2	14.4
32	14.3	14.3	14.4
36	14.4	14.4	14.5
40	14.5	14.5	14.6
44	14.6	14.6	14.7
48	14.7	14.7	14.8
52	14.8	14.9	14.9
56	15.0	15.0	15.0
60	15.1	15.1	15.2
64	15.2	15.3	15.3
68	15.4	15.4	15.4
72	15.5	15.5	15.5
76	15.7	15.7	15.7
80	15.9	15.8	15.8
84	16.0	16.0	16.0
88	16.1	16.1	16.1
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.6 GHA	VENUS −3.6 Dec.	MARS −1.3 GHA	MARS −1.3 Dec.	JUPITER −1.3 GHA	JUPITER −1.3 Dec.	SATURN 0.7 GHA	SATURN 0.7 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
30 0	38 17.0	219 42.6	+ 2 10.5	50 38.3	− 7 52.9	223 49.9	+ 3 33.5	157 59.3	−18 53.1	229 58.8	107	− 0 19.0	−127
1	53 19.5	234 42.2	09.4	65 40.2	52.5	238 51.9	33.3	173 01.4	53.2	244 28.5	107	0 31.7	−127
2	68 21.9	249 41.9	08.3	80 42.2	52.1	253 54.0	33.1	188 03.6	53.2	258 58.2	108	0 44.4	−127
3	83 24.4	264 41.6	07.2	95 44.2	51.7	268 56.0	33.0	203 05.8	53.3	273 28.0	107	0 57.1	−127
4	98 26.9	279 41.3	06.1	110 46.2	51.3	283 58.1	32.8	218 08.0	53.3	287 57.7	107	1 09.8	−127
5	113 29.3	294 41.0	05.0	125 48.2	50.9	299 00.1	32.6	233 10.1	53.4	302 27.4	108	1 22.5	−126
6	128 31.8	309 40.7	+ 2 03.9	140 50.1	− 7 50.5	314 02.1	+ 3 32.4	248 12.3	−18 53.5	316 57.2	107	− 1 35.1	−127
7	143 34.3	324 40.4	02.8	155 52.1	50.2	329 04.2	32.2	263 14.5	53.5	331 26.9	108	1 47.8	−126
8	158 36.7	339 40.1	01.7	170 54.1	49.8	344 06.2	32.1	278 16.7	53.6	345 56.7	107	2 00.4	−126
9	173 39.2	354 39.8	· 2 00.6	185 56.1	49.4	359 08.3	31.9	293 18.9	53.6	0 26.4	108	· 2 13.0	−126
10	188 41.7	9 39.5	1 59.5	200 58.0	49.0	14 10.3	31.7	308 21.0	53.7	14 56.2	108	2 25.6	−126
11	203 44.1	24 39.1	58.4	216 00.0	48.6	29 12.3	31.5	323 23.2	53.8	29 26.0	107	2 38.2	−126
12	218 46.6	39 38.8	+ 1 57.3	231 02.0	− 7 48.2	44 14.4	+ 3 31.4	338 25.4	−18 53.8	43 55.7	108	− 2 50.8	−125
13	233 49.0	54 38.5	56.2	246 03.9	47.8	59 16.4	31.2	353 27.6	53.9	58 25.5	107	3 03.3	−126
14	248 51.5	69 38.2	55.1	261 05.9	47.4	74 18.5	31.0	8 29.7	53.9	72 55.2	108	3 15.9	−125
15	263 54.0	84 37.9	54.0	276 07.9	47.1	89 20.5	30.8	23 31.9	54.0	87 25.0	107	· 3 28.4	−125
16	278 56.4	99 37.6	52.8	291 09.8	46.7	104 22.5	30.7	38 34.1	54.1	101 54.7	108	3 40.9	−124
17	293 58.9	114 37.3	51.7	306 11.8	46.3	119 24.6	30.5	53 36.3	54.1	116 24.5	107	3 53.3	−124
18	309 01.4	129 37.0	+ 1 50.6	321 13.8	− 7 45.9	134 26.6	+ 3 30.3	68 38.5	−18 54.2	130 54.2	108	− 4 05.7	−124
19	324 03.8	144 36.7	49.5	336 15.7	45.5	149 28.6	30.1	83 40.6	54.2	145 24.0	107	4 18.1	−124
20	339 06.3	159 36.3	48.4	351 17.7	45.1	164 30.7	30.0	98 42.8	54.3	159 53.7	107	4 30.5	−124
21	354 08.8	174 36.0	47.3	6 19.7	44.7	179 32.7	29.8	113 45.0	54.3	174 23.4	108	· 4 42.9	−123
22	9 11.2	189 35.7	46.2	21 21.6	44.3	194 34.8	29.6	128 47.2	54.4	188 53.2	107	4 55.2	−123
23	24 13.7	204 35.4	45.1	36 23.6	43.9	209 36.8	29.4	143 49.3	54.5	203 22.9	107	5 07.5	−122
31 0	39 16.2	219 35.1	+ 1 44.0	51 25.5	− 7 43.5	224 38.9	+ 3 29.3	158 51.5	−18 54.5	217 52.6	107	− 5 19.7	−122
1	54 18.6	234 34.8	42.9	66 27.5	43.1	239 40.9	29.1	173 53.7	54.6	232 22.3	107	5 31.9	−122
2	69 21.1	249 34.5	41.8	81 29.4	42.7	254 42.9	28.9	188 55.9	54.6	246 52.0	107	5 44.1	−122
3	84 23.5	264 34.2	40.7	96 31.4	42.4	269 45.0	28.7	203 58.0	54.7	261 21.7	107	· 5 56.3	−121
4	99 26.0	279 33.9	39.6	111 33.3	42.0	284 47.0	28.6	219 00.2	54.8	275 51.4	106	6 08.4	−120
5	114 28.5	294 33.6	38.5	126 35.3	41.6	299 49.1	28.4	234 02.4	54.8	290 21.0	107	6 20.4	−121
6	129 30.9	309 33.2	+ 1 37.4	141 37.3	− 7 41.2	314 51.1	+ 3 28.2	249 04.6	−18 54.9	304 50.7	106	− 6 32.5	−119
7	144 33.4	324 32.9	36.3	156 39.2	40.8	329 53.1	28.0	264 06.7	54.9	319 20.3	106	6 44.4	−120
8	159 35.9	339 32.6	35.1	171 41.2	40.4	344 55.2	27.9	279 08.9	55.0	333 49.9	107	6 56.4	−119
9	174 38.3	354 32.3	34.0	186 43.1	40.0	359 57.2	27.7	294 11.1	55.1	348 19.6	106	· 7 08.3	−118
10	189 40.8	9 32.0	32.9	201 45.0	39.6	14 59.3	27.5	309 13.3	55.1	2 49.2	106	7 20.1	−119
11	204 43.3	24 31.7	31.8	216 47.0	39.2	30 01.3	27.3	324 15.4	55.2	17 18.8	106	7 32.0	−117
12	219 45.7	39 31.4	+ 1 30.7	231 48.9	− 7 38.8	45 03.3	+ 3 27.2	339 17.6	−18 55.2	31 48.4	105	− 7 43.7	−117
13	234 48.2	54 31.1	29.6	246 50.9	38.4	60 05.4	27.0	354 19.8	55.3	46 17.9	106	7 55.4	−117
14	249 50.6	69 30.7	28.5	261 52.8	38.0	75 07.4	26.8	9 22.0	55.4	60 47.5	105	8 07.1	−116
15	264 53.1	84 30.4	27.4	276 54.8	37.6	90 09.5	26.6	24 24.1	55.4	75 17.0	105	· 8 18.7	−116
16	279 55.6	99 30.1	26.3	291 56.7	37.2	105 11.5	26.5	39 26.3	55.5	89 46.5	106	8 30.3	−115
17	294 58.0	114 29.8	25.2	306 58.7	36.8	120 13.6	26.3	54 28.5	55.5	104 16.1	105	8 41.8	−114
18	310 00.5	129 29.5	+ 1 24.1	322 00.6	− 7 36.4	135 15.6	+ 3 26.1	69 30.7	−18 55.6	118 45.6	104	− 8 53.2	−114
19	325 03.0	144 29.2	22.9	337 02.5	36.0	150 17.6	25.9	84 32.9	55.7	133 15.0	105	9 04.6	−114
20	340 05.4	159 28.9	21.8	352 04.5	35.6	165 19.7	25.8	99 35.0	55.7	147 44.5	104	9 16.0	−113
21	355 07.9	174 28.6	20.7	7 06.4	35.2	180 21.7	25.6	114 37.2	55.8	162 13.9	105	· 9 27.3	−112
22	10 10.4	189 28.2	19.6	22 08.3	34.8	195 23.8	25.4	129 39.4	55.8	176 43.4	104	9 38.5	−112
23	25 12.8	204 27.9	18.5	37 10.3	34.4	210 25.8	25.2	144 41.6	55.9	191 12.8	104	9 49.7	−111
1 0	40 15.3	219 27.6	+ 1 17.4	52 12.2	− 7 34.0	225 27.9	+ 3 25.1	159 43.7	−18 55.9	205 42.2	103	−10 00.8	−111
1	55 17.8	234 27.3	16.3	67 14.1	33.6	240 29.9	24.9	174 45.9	56.0	220 11.5	104	10 11.9	−109
2	70 20.2	249 27.0	15.2	82 16.1	33.2	255 32.0	24.7	189 48.1	56.1	234 40.9	103	10 22.8	−110
3	85 22.7	264 26.7	14.1	97 18.0	32.8	270 34.0	24.5	204 50.2	56.1	249 10.2	104	·10 33.8	−108
4	100 25.1	279 26.4	12.9	112 19.9	32.4	285 36.0	24.4	219 52.4	56.2	263 39.6	103	10 44.6	−108
5	115 27.6	294 26.1	11.8	127 21.9	32.0	300 38.1	24.2	234 54.6	56.2	278 08.9	102	10 55.4	−107
6	130 30.1	309 25.7	+ 1 10.7	142 23.8	− 7 31.6	315 40.1	+ 3 24.0	249 56.8	−18 56.3	292 38.1	103	−11 06.1	−107
7	145 32.5	324 25.4	09.6	157 25.7	31.2	330 42.2	23.8	264 58.9	56.4	307 07.4	102	11 16.8	−106
8	160 35.0	339 25.1	08.5	172 27.6	30.8	345 44.2	23.7	280 01.1	56.4	321 36.6	103	11 27.4	−105
9	175 37.5	354 24.8	07.4	187 29.6	30.4	0 46.3	23.5	295 03.3	56.5	336 05.9	102	·11 37.9	−105
10	190 39.9	9 24.5	06.3	202 31.5	30.0	15 48.3	23.3	310 05.5	56.5	350 35.1	101	11 48.4	−104
11	205 42.4	24 24.2	05.2	217 33.4	29.6	30 50.4	23.2	325 07.6	56.6	5 04.2	102	11 58.8	−103
12	220 44.9	39 23.9	+ 1 04.0	232 35.3	− 7 29.2	45 52.4	+ 3 23.0	340 09.8	−18 56.7	19 33.4	102	−12 09.1	−102
13	235 47.3	54 23.5	02.9	247 37.3	28.8	60 54.4	22.8	355 12.0	56.7	34 02.6	101	12 19.3	−102
14	250 49.8	69 23.2	01.8	262 39.2	28.4	75 56.5	22.6	10 14.2	56.8	48 31.7	101	12 29.5	−100
15	265 52.3	84 22.9	· 1 00.7	277 41.1	28.0	90 58.5	22.5	25 16.3	56.8	63 00.8	101	·12 39.5	−101
16	280 54.7	99 22.6	0 59.6	292 43.0	27.6	106 00.6	22.3	40 18.5	56.9	77 29.9	100	12 49.6	− 99
17	295 57.2	114 22.3	58.5	307 44.9	27.2	121 02.6	22.1	55 20.7	57.0	91 58.9	101	12 59.5	− 98
18	310 59.6	129 22.0	+ 0 57.4	322 46.9	− 7 26.8	136 04.7	+ 3 21.9	70 22.9	−18 57.0	106 28.0	100	−13 09.3	− 98
19	326 02.1	144 21.7	56.2	337 48.8	26.4	151 06.7	21.8	85 25.0	57.1	120 57.0	100	13 19.1	− 97
20	341 04.6	159 21.3	55.1	352 50.7	25.9	166 08.8	21.6	100 27.2	57.1	135 26.0	100	13 28.8	− 96
21	356 07.0	174 21.0	54.0	7 52.6	25.5	181 10.8	21.4	115 29.4	57.2	149 55.0	99	·13 38.4	− 96
22	11 09.5	189 20.7	52.9	22 54.5	25.1	196 12.9	21.3	130 31.6	57.3	164 23.9	99	13 48.0	− 94
23	26 12.0	204 20.4	51.8	37 56.4	24.7	211 14.9	21.1	145 33.7	57.3	178 52.8	100	13 57.4	− 94
24	41 14.4	219 20.1	+ 0 50.7	52 58.3	− 7 24.3	226 16.9	+ 3 20.9	160 35.9	−18 57.4	193 21.8	99	−14 06.8	− 92
code	—	− 3	− 11	+ 20	+ 4	+ 21	− 2	+ 22	− 1				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
30 0	184 04.1	−13 42.2	7	Acamar	315 50.1	−40 28.5
1	199 04.1	43.1	5	Achernar	335 57.7	−57 27.3
2	214 04.1	43.9	30	Acrux	173 57.4	−62 51.5
3	229 04.2	.. 44.7	19	Adhara	255 45.7	−28 54.6
4	244 04.2	45.5	10	Aldebaran	291 37.9	+16 25.5
5	259 04.2	46.4				
6	274 04.3	−13 47.2	32	Alioth	166 58.4	+56 11.5
7	289 04.3	48.0	34	Alkaid	153 32.8	+49 31.7
8	304 04.3	48.8	55	Al Na'ir	28 36.8	−47 10.3
9	319 04.3	.. 49.6	15	Alnilam	276 29.2	− 1 13.6
10	334 04.4	50.4	25	Alphard	218 37.9	− 8 28.2
11	349 04.4	51.3				
12	4 04.4	−13 52.1	41	Alphecca	126 47.3	+26 51.7
13	19 04.5	52.9	1	Alpheratz	358 27.2	+28 51.4
14	34 04.5	53.7	51	Altair	62 49.7	+ 8 45.4
15	49 04.5	.. 54.5	2	Ankaa	353 57.2	−42 32.4
16	64 04.6	55.4	42	Antares	113 18.7	−26 20.2
17	79 04.6	56.2				
18	94 04.6	−13 57.0	37	Arcturus	146 34.8	+19 24.4
19	109 04.6	57.8	43	Atria	108 59.2	−68 57.2
20	124 04.7	58.6	22	Avior	234 35.4	−59 22.0
21	139 04.7	·13 59.4	13	Bellatrix	279 17.3	+ 6 18.8
22	154 04.7	14 00.2	16	Betelg'se	271 47.1	+ 7 24.0
23	169 04.7	01.1				
			17	Canopus	264 14.7	−52 40.1
31 0	184 04.8	−14 01.9	12	Capella	281 36.9	+45 57.3
1	199 04.8	02.7	53	Deneb	50 00.4	+45 07.9
2	214 04.8	03.5	28	Denebola	183 17.2	+14 48.8
3	229 04.8	.. 04.3	4	Diphda	349 38.2	−18 13.3
4	244 04.9	05.1				
5	259 04.9	05.9	27	Dubhe	194 44.1	+61 58.8
6	274 04.9	−14 06.7	14	Elnath	279 06.0	+28 34.3
7	289 04.9	07.6	47	Eltanin	91 06.2	+51 29.9
8	304 05.0	08.4	54	Enif	34 28.7	+ 9 40.9
9	319 05.0	.. 09.2	56	Fomalhaut	16 10.6	−29 51.0
10	334 05.0	10.0				
11	349 05.0	10.8	31	Gacrux	172 48.8	−56 52.2
12	4 05.1	−14 11.6	29	Gienah	176 36.3	−17 18.1
13	19 05.1	12.4	35	Hadar	149 48.9	−60 09.9
14	34 05.1	13.2	6	Hamal	328 48.4	+23 15.7
15	49 05.1	.. 14.0	48	Kaus Aust.	84 40.4	−34 24.4
16	64 05.1	14.8				
17	79 05.2	15.6	40	Kochab	137 19.3	+74 19.9
18	94 05.2	−14 16.4	57	Markab	14 20.5	+14 58.6
19	109 05.2	17.3	8	Menkar	314 59.2	+ 3 55.4
20	124 05.2	18.1	36	Menkent	148 58.1	−36 09.4
21	139 05.2	.. 18.9	24	Miapl'dus	221 48.9	−69 32.1
22	154 05.3	19.7				
23	169 05.3	20.5	9	Mirfak	309 40.7	+49 42.6
			50	Nunki	76 51.1	−26 21.1
1 0	184 05.3	−14 21.3	52	Peacock	54 26.1	−56 52.6
1	199 05.3	22.1	21	Pollux	244 19.5	+28 07.8
2	214 05.3	22.9	20	Procyon	245 44.1	+ 5 20.2
3	229 05.3	.. 23.7				
4	244 05.4	24.5	46	R'alhague	96 46.1	+12 35.6
5	259 05.4	25.3	26	Regulus	208 28.8	+12 10.7
6	274 05.4	−14 26.1	11	Rigel	281 52.6	− 8 14.9
7	289 05.4	26.9	38	Rigil Kent.	140 50.5	−60 39.5
8	304 05.4	27.7	44	Sabik	103 01.5	−15 40.3
9	319 05.4	.. 28.5				
10	334 05.4	29.3	3	Schedar	350 28.5	+56 18.3
11	349 05.5	30.1	45	Shaula	97 19.9	−37 04.4
12	4 05.5	−14 30.9	18	Sirius	259 11.0	−16 39.2
13	19 05.5	31.7	33	Spica	159 16.4	−10 56.1
14	34 05.5	32.5	23	Suhail	223 23.8	−43 15.3
15	49 05.5	.. 33.3				
16	64 05.5	34.1	49	Vega	81 07.9	+38 44.9
17	79 05.5	34.9	39	Zub'g'bi	137 52.8	−15 51.7
18	94 05.5	−14 35.7				
19	109 05.6	36.5				
20	124 05.6	37.3				
21	139 05.6	.. 38.1				
22	154 05.6	38.9				
23	169 05.6	39.7				
24	184 05.6	−14 40.5				
code	−	− 8				

GMT	Equation of Time (App.−Mean) 30	31	1
h	m s	m s	m s
0	+16 16.2	+16 19.0	+16 21.1
6	+16 17.0	+16 19.6	+16 21.5
12	+16 17.7	+16 20.2	+16 21.8
18	+16 18.4	+16 20.7	+16 22.1
24	+16 19.0	+16 21.1	+16 22.4

Lat. N °	Sunrise h m	Twlt. begins h m	Moonrise 30 h m	31 h m	1 h m	2 h m
72	8 51	4 41	3 00	5 01	7 06	9 24
70	8 26	4 45	2 58	4 51	6 45	8 44
68	8 07	4 49	2 57	4 43	6 30	8 17
66	7 52	4 51	2 56	4 36	6 17	7 56
64	7 39	4 53	2 55	4 31	6 06	7 40
62	7 29	4 54	2 54	4 26	5 57	7 27
60	7 20	4 55	2 54	4 22	5 50	7 15
58	7 12	4 56	2 53	4 18	5 43	7 05
56	7 05	4 57	2 52	4 15	5 37	6 57
54	6 59	4 57	2 52	4 12	5 32	6 49
52	6 53	4 57	2 52	4 10	5 27	6 42
50	6 48	4 57	2 51	4 07	5 23	6 36
45	6 37	4 57	2 50	4 02	5 13	6 23
40	6 28	4 56	2 50	3 58	5 06	6 12
35	6 20	4 54	2 49	3 54	4 59	6 03
30	6 13	4 51	2 49	3 51	4 54	5 55
20	6 01	4 46	2 48	3 46	4 44	5 41
10	5 50	4 39	2 47	3 41	4 35	5 29
0	5 40	4 29	2 46	3 36	4 27	5 18
10	5 30	4 17	2 46	3 32	4 19	5 07
20	5 19	4 03	2 45	3 27	4 10	4 55
30	5 06	3 41	2 44	3 22	4 01	4 42
35	4 59	3 27	2 44	3 19	3 55	4 34
40	4 51	3 10	2 43	3 16	3 49	4 25
45	4 41	2 47	2 43	3 12	3 42	4 15
50	4 29	2 15	2 42	3 07	3 34	4 03
52	4 23	1 58	2 42	3 05	3 30	3 57
54	4 17	1 36	2 42	3 03	3 25	3 51
56	4 10	1 06	2 41	3 00	3 21	3 44
58	4 02	////	2 41	2 57	3 15	3 36
60	3 53	////	2 41	2 54	3 09	3 27
S						

Lat. N °	Sunset h m	Twlt. ends h m	Moonset 30 h m	31 h m	1 h m	2 h m
72	14 35	18 41	14 26	14 10	13 52	13 21
70	15 00	18 37	14 30	14 23	14 14	14 02
68	15 19	18 34	14 34	14 33	14 31	14 31
66	15 35	18 33	14 38	14 41	14 45	14 52
64	15 47	18 31	14 40	14 48	14 57	15 09
62	15 58	18 30	14 43	14 54	15 07	15 24
60	16 07	18 29	14 45	14 59	15 15	15 36
58	16 15	18 29	14 47	15 04	15 23	15 46
56	16 22	18 28	14 48	15 08	15 30	15 55
54	16 28	18 28	14 50	15 12	15 36	16 03
52	16 33	18 27	14 51	15 15	15 41	16 11
50	16 39	18 28	14 53	15 18	15 46	16 17
45	16 50	18 29	14 56	15 25	15 57	16 31
40	16 59	18 31	14 58	15 31	16 05	16 43
35	17 07	18 33	15 00	15 36	16 13	16 53
30	17 14	18 35	15 02	15 40	16 20	17 02
20	17 26	18 41	15 05	15 47	16 31	17 17
10	17 37	18 49	15 08	15 54	16 42	17 30
0	17 47	18 58	15 10	16 00	16 51	17 43
10	17 57	19 10	15 13	16 07	17 01	17 55
20	18 09	19 26	15 15	16 13	17 11	18 09
30	18 21	19 47	15 19	16 21	17 23	18 24
35	18 29	20 02	15 20	16 25	17 30	18 33
40	18 38	20 20	15 22	16 30	17 38	18 43
45	18 48	20 44	15 25	16 36	17 47	18 55
50	19 00	21 16	15 27	16 43	17 58	19 10
52	19 06	21 35	15 29	16 46	18 03	19 17
54	19 12	21 57	15 30	16 50	18 09	19 24
56	19 19	22 30	15 32	16 54	18 15	19 33
58	19 27	////	15 33	16 58	18 22	19 43
60	19 36	////	15 35	17 03	18 30	19 54
S						

DAY	GMT of Transit Meridian of Greenwich Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
30	8 58	9 21	20 35	9 03	13 26
31	9 48	9 22	20 32	9 00	13 23
1	10 39	9 22	20 29	8 57	13 19
2	11 31	9 23	20 26	8 54	13 16

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.4	0.1	0.3
30	0.4	0.1	0.2
45	0.4	0.1	0.2
60	0.4	0.0	0.1
75	0.4	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt. °	30 ′	31 ′	1 ′
0	17.8	17.3	16.8
4	17.8	17.3	16.8
8	17.8	17.3	16.8
12	17.8	17.3	16.8
16	17.8	17.3	16.8
20	17.7	17.2	16.8
24	17.7	17.2	16.7
28	17.6	17.1	16.7
32	17.5	17.1	16.7
36	17.5	17.0	16.6
40	17.4	17.0	16.6
44	17.3	16.9	16.5
48	17.2	16.8	16.5
52	17.1	16.8	16.4
56	17.0	16.7	16.4
60	16.9	16.6	16.3
64	16.8	16.5	16.2
68	16.7	16.4	16.2
72	16.5	16.3	16.1
76	16.4	16.2	16.0
80	16.3	16.1	16.0
84	16.2	16.0	15.9
88	16.1	16.0	15.8
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt. °	30 ′	31 ′	1 ′
0	14.2	14.5	14.8
4	14.3	14.5	14.8
8	14.3	14.6	14.8
12	14.3	14.6	14.9
16	14.3	14.6	14.9
20	14.4	14.6	14.9
24	14.4	14.7	14.9
28	14.5	14.7	15.0
32	14.5	14.8	15.0
36	14.6	14.8	15.0
40	14.7	14.9	15.1
44	14.8	15.0	15.1
48	14.9	15.0	15.2
52	15.0	15.1	15.2
56	15.1	15.2	15.3
60	15.2	15.3	15.4
64	15.3	15.4	15.4
68	15.4	15.5	15.5
72	15.5	15.5	15.5
76	15.7	15.6	15.6
80	15.8	15.7	15.7
84	15.9	15.8	15.8
88	16.0	15.9	15.8
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.5 GHA	VENUS −3.5 Dec.	MARS −1.2 GHA	MARS −1.2 Dec.	JUPITER −1.3 GHA	JUPITER −1.3 Dec.	SATURN 0.7 GHA	SATURN 0.7 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
2 00	41 14.4	219 20.1	+ 0 50.7	52 58.3	− 7 24.3	226 16.9	+ 3 20.9	160 35.9	−18 57.4	193 21.8	99	−14 06.8	− 92
01	56 16.9	234 19.8	49.5	68 00.2	23.9	241 19.0	20.7	175 38.1	57.4	207 50.7	98	14 16.0	− 92
02	71 19.4	249 19.4	48.4	83 02.1	23.5	256 21.0	20.6	190 40.3	57.5	222 19.5	99	14 25.2	− 91
03	86 21.8	264 19.1	·· 47.3	98 04.1	·· 23.1	271 23.1	·· 20.4	205 42.4	·· 57.5	236 48.4	98	·14 34.3	− 91
04	101 24.3	279 18.8	46.2	113 06.0	22.7	286 25.1	20.2	220 44.6	57.6	251 17.2	98	14 43.4	− 89
05	116 26.7	294 18.5	45.1	128 07.9	22.3	301 27.2	20.0	235 46.8	57.7	265 46.0	98	14 52.3	− 88
06	131 29.2	309 18.2	+ 0 44.0	143 09.8	− 7 21.9	316 29.2	+ 3 19.9	250 48.9	−18 57.7	280 14.8	98	−15 01.1	− 88
07	146 31.7	324 17.9	42.8	158 11.7	21.4	331 31.3	19.7	265 51.1	57.8	294 43.6	98	15 09.9	− 86
08	161 34.1	339 17.6	41.7	173 13.6	21.0	346 33.3	19.5	280 53.3	57.8	309 12.4	97	15 18.5	− 86
09	176 36.6	354 17.2	·· 40.6	188 15.5	·· 20.6	1 35.4	·· 19.4	295 55.5	·· 57.9	323 41.1	97	·15 27.1	− 85
10	191 39.1	9 16.9	39.5	203 17.4	20.2	16 37.4	19.2	310 57.6	58.0	338 09.8	97	15 35.6	− 84
11	206 41.5	24 16.6	38.4	218 19.3	19.8	31 39.5	19.0	325 59.8	58.0	352 38.5	97	15 44.0	− 83
12	221 44.0	39 16.3	+ 0 37.3	233 21.2	− 7 19.4	46 41.5	+ 3 18.8	341 02.0	−18 58.1	7 07.2	97	−15 52.3	− 82
13	236 46.5	54 16.0	36.1	248 23.1	19.0	61 43.6	18.7	356 04.2	58.1	21 35.9	96	16 00.5	− 81
14	251 48.9	69 15.7	35.0	263 25.0	18.6	76 45.6	18.5	11 06.3	58.2	36 04.5	96	16 08.6	− 80
15	266 51.4	84 15.3	·· 33.9	278 26.9	·· 18.2	91 47.7	·· 18.3	26 08.5	·· 58.3	50 33.1	97	·16 16.6	− 79
16	281 53.9	99 15.0	32.8	293 28.8	17.7	106 49.7	18.2	41 10.7	58.3	65 01.8	95	16 24.5	− 78
17	296 56.3	114 14.7	31.7	308 30.7	17.3	121 51.8	18.0	56 12.8	58.4	79 30.3	96	16 32.3	− 77
18	311 58.8	129 14.4	+ 0 30.5	323 32.5	− 7 16.9	136 53.8	+ 3 17.8	71 15.0	−18 58.4	93 58.9	96	−16 40.0	− 76
19	327 01.2	144 14.1	29.4	338 34.4	16.5	151 55.9	17.6	86 17.2	58.5	108 27.5	95	16 47.6	− 76
20	342 03.7	159 13.8	28.3	353 36.3	16.1	166 57.9	17.5	101 19.4	58.6	122 56.0	96	16 55.2	− 74
21	357 06.2	174 13.4	·· 27.2	8 38.2	·· 15.7	182 00.0	·· 17.3	116 21.5	·· 58.6	137 24.6	95	·17 02.6	− 73
22	12 08.6	189 13.1	26.1	23 40.1	15.3	197 02.0	17.1	131 23.7	58.7	151 53.1	95	17 09.9	− 72
23	27 11.1	204 12.8	24.9	38 42.0	14.8	212 04.1	17.0	146 25.9	58.7	166 21.6	95	17 17.1	− 71
3 00	42 13.6	219 12.5	+ 0 23.8	53 43.9	− 7 14.4	227 06.1	+ 3 16.8	161 28.1	−18 58.8	180 50.1	94	−17 24.2	− 70
01	57 16.0	234 12.2	22.7	68 45.8	14.0	242 08.2	16.6	176 30.2	58.9	195 18.5	95	17 31.2	− 69
02	72 18.5	249 11.9	21.6	83 47.7	13.6	257 10.2	16.4	191 32.4	58.9	209 47.0	94	17 38.1	− 69
03	87 21.0	264 11.5	·· 20.5	98 49.5	·· 13.2	272 12.3	·· 16.3	206 34.6	·· 59.0	224 15.4	95	·17 45.0	− 67
04	102 23.4	279 11.2	19.3	113 51.4	12.8	287 14.3	16.1	221 36.7	59.0	238 43.9	94	17 51.7	− 65
05	117 25.9	294 10.9	18.2	128 53.3	12.3	302 16.4	15.9	236 38.9	59.1	253 12.3	94	17 58.2	− 65
06	132 28.4	309 10.6	+ 0 17.1	143 55.2	− 7 11.9	317 18.4	+ 3 15.8	251 41.1	−18 59.1	267 40.7	94	−18 04.7	− 64
07	147 30.8	324 10.3	16.0	158 57.1	11.5	332 20.5	15.6	266 43.3	59.2	282 09.1	94	18 11.1	− 63
08	162 33.3	339 09.9	14.9	173 58.9	11.1	347 22.5	15.4	281 45.4	59.3	296 37.5	94	18 17.4	− 62
09	177 35.7	354 09.6	·· 13.7	189 00.8	·· 10.7	2 24.6	·· 15.2	296 47.6	·· 59.3	311 05.9	94	·18 23.6	− 61
10	192 38.2	9 09.3	12.6	204 02.7	10.3	17 26.6	15.1	311 49.8	59.4	325 34.3	93	18 29.7	− 59
11	207 40.7	24 09.0	11.5	219 04.6	09.8	32 28.7	14.9	326 51.9	59.4	340 02.6	94	18 35.6	− 59
12	222 43.1	39 08.7	+ 0 10.4	234 06.4	− 7 09.4	47 30.7	+ 3 14.7	341 54.1	−18 59.5	354 31.0	93	−18 41.5	− 57
13	237 45.6	54 08.4	09.2	249 08.3	09.0	62 32.8	14.6	356 56.3	59.6	8 59.3	94	18 47.2	− 56
14	252 48.1	69 08.0	08.1	264 10.2	08.6	77 34.8	14.4	11 58.5	59.6	23 27.7	93	18 52.8	− 56
15	267 50.5	84 07.7	·· 07.0	279 12.1	·· 08.2	92 36.9	·· 14.2	27 00.6	·· 59.7	37 56.0	93	·18 58.4	− 54
16	282 53.0	99 07.4	05.9	294 13.9	07.7	107 38.9	14.0	42 02.8	59.7	52 24.3	94	19 03.8	− 53
17	297 55.5	114 07.1	04.8	309 15.8	07.3	122 41.0	13.9	57 05.0	59.8	66 52.7	93	19 09.1	− 52
18	312 57.9	129 06.8	+ 0 03.6	324 17.7	− 7 06.9	137 43.0	+ 3 13.7	72 07.1	−18 59.9	81 21.0	93	−19 14.3	− 51
19	328 00.4	144 06.4	02.5	339 19.6	06.5	152 45.1	13.5	87 09.3	18 59.9	95 49.3	93	19 19.4	− 49
20	343 02.8	159 06.1	01.4	354 21.4	06.1	167 47.1	13.4	102 11.5	19 00.0	110 17.6	93	19 24.3	− 49
21	358 05.3	174 05.8	+ 0 00.3	9 23.3	·· 05.6	182 49.2	·· 13.2	117 13.7	·· 00.0	124 45.9	93	·19 29.2	− 48
22	13 07.8	189 05.5	− 0 00.9	24 25.2	05.2	197 51.2	13.0	132 15.8	00.1	139 14.2	94	19 34.0	− 46
23	28 10.2	204 05.2	02.0	39 27.0	04.8	212 53.3	12.9	147 18.0	00.2	153 42.6	93	19 38.6	− 45
4 00	43 12.7	219 04.8	− 0 03.1	54 28.9	− 7 04.4	227 55.3	+ 3 12.7	162 20.2	−19 00.2	168 10.9	93	−19 43.1	− 44
01	58 15.2	234 04.5	04.2	69 30.7	03.9	242 57.4	12.5	177 22.3	00.3	182 39.2	93	19 47.5	− 44
02	73 17.6	249 04.2	05.4	84 32.6	03.5	257 59.4	12.3	192 24.5	00.3	197 07.5	93	19 51.9	− 41
03	88 20.1	264 03.9	·· 06.5	99 34.5	·· 03.1	273 01.5	·· 12.2	207 26.7	·· 00.4	211 35.8	93	·19 56.0	− 41
04	103 22.6	279 03.6	07.6	114 36.3	02.7	288 03.6	12.0	222 28.9	00.4	226 04.1	94	20 00.1	− 40
05	118 25.0	294 03.2	08.7	129 38.2	02.2	303 05.6	11.8	237 31.0	00.5	240 32.5	93	20 04.1	− 38
06	133 27.5	309 02.9	− 0 09.9	144 40.0	− 7 01.8	318 07.7	+ 3 11.7	252 33.2	−19 00.6	255 00.8	93	−20 07.9	− 38
07	148 30.0	324 02.6	11.0	159 41.9	01.4	333 09.7	11.5	267 35.4	00.6	269 29.1	94	20 11.7	− 36
08	163 32.4	339 02.3	12.1	174 43.8	01.0	348 11.8	11.3	282 37.5	00.7	283 57.5	93	20 15.3	− 35
09	178 34.9	354 01.9	·· 13.2	189 45.6	·· 00.5	3 13.8	·· 11.2	297 39.7	·· 00.7	298 25.8	94	·20 18.8	− 34
10	193 37.3	9 01.6	14.4	204 47.5	7 00.1	18 15.9	11.0	312 41.9	00.8	312 54.2	94	20 22.2	− 33
11	208 39.8	24 01.3	15.5	219 49.3	6 59.7	33 17.9	10.8	327 44.0	00.9	327 22.6	93	20 25.5	− 32
12	223 42.3	39 01.0	− 0 16.6	234 51.2	− 6 59.3	48 20.0	+ 3 10.7	342 46.2	−19 00.9	341 50.9	94	−20 28.7	− 30
13	238 44.7	54 00.7	17.7	249 53.0	58.8	63 22.0	10.5	357 48.4	01.0	356 19.3	94	20 31.7	− 30
14	253 47.2	69 00.3	18.9	264 54.9	58.4	78 24.1	10.3	12 50.6	01.0	10 47.7	94	20 34.7	− 28
15	268 49.7	84 00.0	·· 20.0	279 56.7	·· 58.0	93 26.1	·· 10.1	27 52.7	·· 01.1	25 16.1	94	·20 37.5	− 27
16	283 52.1	98 59.7	21.1	294 58.6	57.6	108 28.2	10.0	42 54.9	01.2	39 44.5	95	20 40.2	− 26
17	298 54.6	113 59.4	22.2	310 00.4	57.1	123 30.3	09.8	57 57.1	01.2	54 13.0	94	20 42.8	− 25
18	313 57.1	128 59.1	− 0 23.4	325 02.3	− 6 56.7	138 32.3	+ 3 09.6	72 59.2	−19 01.3	68 41.4	95	−20 45.3	− 24
19	328 59.5	143 58.7	24.5	340 04.1	56.3	153 34.4	09.5	88 01.4	01.3	83 09.9	95	20 47.7	− 22
20	344 02.0	158 58.4	25.6	355 06.0	55.8	168 36.4	09.3	103 03.6	01.4	97 38.4	95	20 49.9	− 22
21	359 04.5	173 58.1	·· 26.7	10 07.8	·· 55.4	183 38.5	·· 09.1	118 05.7	·· 01.5	112 06.9	95	·20 52.1	− 20
22	14 06.9	188 57.8	27.9	25 09.7	55.0	198 40.5	09.0	133 07.9	01.5	126 35.4	95	20 54.1	− 19
23	29 09.4	203 57.4	29.0	40 11.5	54.6	213 42.6	08.8	148 10.1	01.6	141 03.9	96	20 56.0	− 18
24	44 11.8	218 57.1	− 0 30.1	55 13.3	− 6 54.1	228 44.7	+ 3 08.6	163 12.3	−19 01.6	155 32.5	95	−20 57.8	− 17
code	−	− 3	− 12	+ 19	+ 4	+ 21	− 1	+ 22	− 1				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
2 00	184 05.6	−14 40.5
01	199 05.6	41.2
02	214 05.6	42.0
03	229 05.6	42.8
04	244 05.6	43.6
05	259 05.6	44.4
06	274 05.6	−14 45.2
07	289 05.7	46.0
08	304 05.7	46.8
09	319 05.7	47.6
10	334 05.7	48.4
11	349 05.7	49.2
12	4 05.7	−14 50.0
13	19 05.7	50.7
14	34 05.7	51.5
15	49 05.7	52.3
16	64 05.7	53.1
17	79 05.7	53.9
18	94 05.7	−14 54.7
19	109 05.7	55.5
20	124 05.7	56.3
21	139 05.7	57.0
22	154 05.7	57.8
23	169 05.7	58.6
3 00	184 05.7	−14 59.4
01	199 05.7	15 00.2
02	214 05.7	01.0
03	229 05.7	01.7
04	244 05.7	02.5
05	259 05.7	03.3
06	274 05.7	−15 04.1
07	289 05.7	04.9
08	304 05.7	05.6
09	319 05.7	06.4
10	334 05.7	07.2
11	349 05.7	08.0
12	4 05.7	−15 08.8
13	19 05.7	09.5
14	34 05.7	10.3
15	49 05.7	11.1
16	64 05.7	11.9
17	79 05.7	12.7
18	94 05.7	−15 13.4
19	109 05.7	14.2
20	124 05.7	15.0
21	139 05.6	15.8
22	154 05.6	16.5
23	169 05.6	17.3
4 00	184 05.6	−15 18.1
01	199 05.6	18.9
02	214 05.6	19.6
03	229 05.6	20.4
04	244 05.6	21.2
05	259 05.6	21.9
06	274 05.6	−15 22.7
07	289 05.6	23.5
08	304 05.5	24.3
09	319 05.5	25.0
10	334 05.5	25.8
11	349 05.5	26.6
12	4 05.5	−15 27.3
13	19 05.5	28.1
14	34 05.5	28.9
15	49 05.5	29.6
16	64 05.4	30.4
17	79 05.4	31.2
18	94 05.4	−15 31.9
19	109 05.4	32.7
20	124 05.4	33.5
21	139 05.4	34.2
22	154 05.4	35.0
23	169 05.3	35.8
24	184 05.3	−15 36.5
code	—	− 7

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 50.1	−40 28.5
5	Achernar	335 57.7	−57 27.3
30	Acrux	173 57.4	−62 51.5
19	Adhara	255 45.7	−28 54.6
10	Aldebaran	291 37.8	+16 25.5
32	Alioth	166 58.4	+56 11.5
34	Alkaid	153 32.8	+49 31.6
55	Al Na'ir	28 36.8	−47 10.3
15	Alnilam	276 29.2	− 1 13.6
25	Alphard	218 37.8	− 8 28.2
41	Alphecca	126 47.3	+26 51.7
1	Alpheratz	358 27.2	+28 51.4
51	Altair	62 49.7	+ 8 45.4
2	Ankaa	353 57.2	−42 32.4
42	Antares	113 18.7	−26 20.2
37	Arcturus	146 34.8	+19 24.4
43	Atria	108 59.2	−68 57.1
22	Avior	234 35.3	−59 22.0
13	Bellatrix	279 17.3	+ 6 18.8
16	Betelg'se	271 47.0	+ 7 24.0
17	Canopus	264 14.7	−52 40.1
12	Capella	281 36.8	+45 57.3
53	Deneb	50 00.5	+45 07.9
28	Denebola	183 17.2	+14 48.7
4	Diphda	349 38.2	−18 13.3
27	Dubhe	194 44.1	+61 58.8
14	Elnath	279 06.0	+28 34.3
47	Eltanin	91 06.2	+51 29.9
54	Enif	34 28.7	+ 9 40.9
56	Fomalhaut	16 10.6	−29 51.0
31	Gacrux	172 48.8	−56 52.2
29	Gienah	176 36.3	−17 18.1
35	Hadar	149 48.9	−60 09.9
6	Hamal	328 48.4	+23 15.7
48	Kaus Aust.	84 40.4	−34 24.4
40	Kochab	137 19.3	+74 19.9
57	Markab	14 20.5	+14 58.6
8	Menkar	314 59.2	+ 3 55.4
36	Menkent	148 58.1	−36 09.4
24	Miapl'dus	221 48.8	−69 32.1
9	Mirfak	309 40.7	+49 42.6
50	Nunki	76 51.1	−26 21.1
52	Peacock	54 26.1	−56 52.6
21	Pollux	244 19.5	+28 07.8
20	Procyon	245 44.0	+ 5 20.2
46	R'alhague	96 46.1	+12 35.6
26	Regulus	208 28.8	+12 10.7
11	Rigel	281 52.6	− 8 14.9
38	Rigil Kent.	140 50.5	−60 39.5
44	Sabik	103 01.5	−15 40.3
3	Schedar	350 28.5	+56 18.3
45	Shaula	97 19.9	−37 04.4
18	Sirius	259 11.0	−16 39.2
33	Spica	159 16.3	−10 56.1
23	Suhail	223 23.7	−43 15.3
49	Vega	81 08.0	+38 44.9
39	Zub'g'bi	137 52.8	−15 51.7

Lat. N °	Sunrise h m	Twlt. begins h m
72	9 10	4 53
70	8 41	4 56
68	8 19	4 58
66	8 03	4 59
64	7 49	5 01
62	7 37	5 01
60	7 27	5 02
58	7 19	5 02
56	7 11	5 02
54	7 05	5 02
52	6 58	5 02
50	6 53	5 01
45	6 41	5 00
40	6 31	4 58
35	6 23	4 56
30	6 15	4 54
20	6 02	4 47
10	5 51	4 39
0	5 40	4 29
10	5 29	4 16
20	5 17	4 00
30	5 04	3 37
35	4 56	3 23
40	4 47	3 05
45	4 36	2 40
50	4 23	2 06
52	4 17	1 47
54	4 10	1 21
56	4 03	0 41
58	3 54	////
60	3 44	////
S		

Lat. N °	Sunset h m	Twlt. ends h m
72	14 16	18 29
70	14 45	18 27
68	15 07	18 26
66	15 24	18 24
64	15 37	18 23
62	15 49	18 23
60	15 59	18 22
58	16 08	18 23
56	16 15	18 22
54	16 22	18 23
52	16 28	18 23
50	16 34	18 24
45	16 45	18 25
40	16 55	18 27
35	17 04	18 30
30	17 12	18 33
20	17 25	18 40
10	17 36	18 48
0	17 47	18 58
10	17 58	19 11
20	18 10	19 28
30	18 24	19 51
35	18 32	20 06
40	18 41	20 25
45	18 52	20 50
50	19 05	21 25
52	19 11	21 45
54	19 18	22 12
56	19 26	22 56
58	19 34	////
60	19 44	////
S		

Lat. N °	Moonrise 2 h m	3 h m	4 h m	5 h m
72	9 24	▬	▬	▬
70	8 44	10 53	▬	▬
68	8 17	10 04	11 45	13 04
66	7 56	9 33	11 00	12 07
64	7 40	9 10	10 30	11 34
62	7 27	8 51	10 07	11 10
60	7 15	8 36	9 49	10 50
58	7 05	8 24	9 34	10 34
56	6 57	8 13	9 21	10 21
54	6 49	8 03	9 10	10 09
52	6 42	7 54	9 00	9 58
50	6 36	7 47	8 52	9 49
45	6 23	7 30	8 33	9 29
40	6 12	7 17	8 18	9 14
35	6 03	7 05	8 05	9 00
30	5 55	6 56	7 54	8 48
20	5 41	6 39	7 35	8 28
10	5 29	6 24	7 18	8 11
0	5 18	6 10	7 03	7 55
10	5 07	5 57	6 47	7 39
20	4 55	5 42	6 31	7 21
30	4 42	5 25	6 12	7 02
35	4 34	5 16	6 01	6 50
40	4 25	5 05	5 49	6 37
45	4 15	4 52	5 34	6 21
50	4 03	4 37	5 16	6 02
52	3 57	4 29	5 08	5 53
54	3 51	4 21	4 58	5 42
56	3 44	4 12	4 47	5 31
58	3 36	4 02	4 35	5 18
60	3 27	3 51	4 21	5 02

Lat. N °	Moonset 2 h m	3 h m	4 h m	5 h m
72	13 21	▬	▬	▬
70	14 02	13 43	▬	▬
68	14 31	14 33	14 40	15 10
66	14 52	15 04	15 26	16 07
64	15 09	15 28	15 56	16 40
62	15 24	15 47	16 19	17 05
60	15 36	16 02	16 38	17 24
58	15 46	16 15	16 53	17 40
56	15 55	16 27	17 06	17 54
54	16 03	16 37	17 17	18 06
52	16 11	16 46	17 27	18 16
50	16 17	16 54	17 36	18 25
45	16 31	17 11	17 55	18 45
40	16 43	17 25	18 11	19 01
35	16 53	17 37	18 24	19 14
30	17 02	17 47	18 35	19 26
20	17 17	18 05	18 55	19 46
10	17 30	18 21	19 12	20 03
0	17 43	18 35	19 28	20 20
10	17 55	18 50	19 44	20 36
20	18 09	19 06	20 01	20 53
30	18 24	19 24	20 20	21 13
35	18 33	19 34	20 32	21 25
40	18 43	19 46	20 45	21 38
45	18 55	20 01	21 01	21 54
50	19 10	20 18	21 20	22 13
52	19 17	20 26	21 29	22 22
54	19 24	20 35	21 39	22 32
56	19 33	20 46	21 50	22 44
58	19 43	20 58	22 03	22 57
60	19 54	21 12	22 19	23 13

GMT h	Equation of Time (App.—Mean) 2 m s	3 m s	4 m s
0	+16 22.4	+16 22.9	+16 22.5
6	+16 22.6	+16 22.8	+16 22.3
12	+16 22.7	+16 22.8	+16 22.0
18	+16 22.8	+16 22.7	+16 21.7
24	+16 22.9	+16 22.5	+16 21.3

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
2	11 31	9 23	20 26	8 54	13 16
3	12 23	9 23	20 23	8 50	13 12
4	13 15	9 24	20 20	8 47	13 09
5	14 07	9 24	20 17	8 44	13 05

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.5	0.1	0.2
30	0.5	0.1	0.2
45	0.5	0.1	0.2
60	0.5	0.0	0.1
75	0.5	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt. °	2 ′	3 ′	4 ′
0	16.1	15.3	14.5
4	16.1	15.3	14.5
8	16.1	15.3	14.5
12	16.0	15.3	14.6
16	16.0	15.3	14.6
20	16.0	15.3	14.6
24	16.0	15.3	14.6
28	16.0	15.3	14.6
32	16.0	15.3	14.7
36	16.0	15.3	14.7
40	16.0	15.3	14.7
44	15.9	15.4	14.8
48	15.9	15.4	14.8
52	15.9	15.4	14.9
56	15.9	15.4	14.9
60	15.8	15.4	15.0
64	15.8	15.4	15.0
68	15.8	15.4	15.1
72	15.8	15.4	15.1
76	15.7	15.5	15.2
80	15.7	15.5	15.2
84	15.7	15.5	15.3
88	15.7	15.5	15.3
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt. °	2 ′	3 ′	4 ′
0	15.3	15.7	16.1
4	15.3	15.7	16.1
8	15.3	15.7	16.1
12	15.3	15.7	16.1
16	15.3	15.7	16.1
20	15.3	15.7	16.1
24	15.3	15.7	16.1
28	15.3	15.7	16.0
32	15.3	15.7	16.0
36	15.3	15.7	16.0
40	15.4	15.6	15.9
44	15.4	15.6	15.9
48	15.4	15.6	15.8
52	15.4	15.6	15.8
56	15.4	15.6	15.8
60	15.5	15.6	15.7
64	15.5	15.6	15.7
68	15.5	15.6	15.6
72	15.5	15.6	15.6
76	15.6	15.5	15.5
80	15.6	15.5	15.4
84	15.6	15.5	15.4
88	15.7	15.5	15.3
90			

Subtract from table, back cover

New Moon 2

GMT	♈ GHA	VENUS −3.5 GHA	VENUS −3.5 Dec.	MARS −1.1 GHA	MARS −1.1 Dec.	JUPITER −1.4 GHA	JUPITER −1.4 Dec.	SATURN 0.7 GHA	SATURN 0.7 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
5 00	44 11.8	218 57.1	− 0 30.1	55 13.3	− 6 54.1	228 44.7	+ 3 08.6	163 12.3	−19 01.6	155 32.5	95	−20 57.8	− 17
01	59 14.3	233 56.8	31.2	70 15.2	53.7	243 46.7	08.5	178 14.4	01.7	170 01.0	96	20 59.5	− 16
02	74 16.8	248 56.5	32.4	85 17.0	53.3	258 48.8	08.3	193 16.6	01.7	184 29.6	96	21 01.1	− 15
03	89 19.2	263 56.1	·· 33.5	100 18.9	·· 52.8	273 50.8	·· 08.1	208 18.8	·· 01.8	198 58.2	97	·21 02.6	− 13
04	104 21.7	278 55.8	34.6	115 20.7	52.4	288 52.9	08.0	223 20.9	01.9	213 26.9	96	21 03.9	− 12
05	119 24.2	293 55.5	35.8	130 22.5	52.0	303 54.9	07.8	238 23.1	01.9	227 55.5	97	21 05.1	− 12
06	134 26.6	308 55.2	− 0 36.9	145 24.4	− 6 51.5	318 57.0	+ 3 07.6	253 25.3	−19 02.0	242 24.2	97	−21 06.3	− 10
07	149 29.1	323 54.9	38.0	160 26.2	51.1	333 59.0	07.5	268 27.4	02.0	256 52.9	97	21 07.3	− 9
08	164 31.6	338 54.5	39.1	175 28.0	50.7	349 01.1	07.3	283 29.6	02.1	271 21.6	98	21 08.2	− 8
09	179 34.0	353 54.2	·· 40.3	190 29.9	·· 50.2	4 03.2	·· 07.1	298 31.8	·· 02.2	285 50.4	97	·21 09.0	− 6
10	194 36.5	8 53.9	41.4	205 31.7	49.8	19 05.2	06.9	313 33.9	02.2	300 19.1	98	21 09.6	− 6
11	209 38.9	23 53.6	42.5	220 33.5	49.4	34 07.3	06.8	328 36.1	02.3	314 47.9	99	21 10.2	− 5
12	224 41.4	38 53.2	− 0 43.7	235 35.4	− 6 48.9	49 09.3	+ 3 06.6	343 38.3	−19 02.3	329 16.8	99	−21 10.7	− 3
13	239 43.9	53 52.9	44.8	250 37.2	48.5	64 11.4	06.4	358 40.5	02.4	343 45.7	98	21 11.0	− 2
14	254 46.3	68 52.6	45.9	265 39.0	48.1	79 13.5	06.3	13 42.6	02.5	358 14.5	100	21 11.2	− 2
15	269 48.8	83 52.3	·· 47.0	280 40.9	·· 47.6	94 15.5	·· 06.1	28 44.8	·· 02.5	12 43.5	99	·21 11.4	0
16	284 51.3	98 51.9	48.2	295 42.7	47.2	109 17.6	05.9	43 47.0	02.6	27 12.4	100	21 11.4	+ 1
17	299 53.7	113 51.6	49.3	310 44.5	46.8	124 19.6	05.8	58 49.1	02.6	41 41.4	100	21 11.3	+ 3
18	314 56.2	128 51.3	− 0 50.4	325 46.3	− 6 46.3	139 21.7	+ 3 05.6	73 51.3	−19 02.7	56 10.4	101	−21 11.0	+ 3
19	329 58.7	143 51.0	51.6	340 48.2	45.9	154 23.7	05.4	88 53.5	02.7	70 39.5	101	21 10.7	+ 4
20	345 01.1	158 50.6	52.7	355 50.0	45.5	169 25.8	05.3	103 55.6	02.8	85 08.6	101	21 10.3	+ 5
21	0 03.6	173 50.3	·· 53.8	10 51.8	·· 45.0	184 27.9	·· 05.1	118 57.8	·· 02.9	99 37.7	101	·21 09.8	+ 7
22	15 06.1	188 50.0	54.9	25 53.6	44.6	199 29.9	04.9	134 00.0	02.9	114 06.8	102	21 09.1	+ 7
23	30 08.5	203 49.7	56.1	40 55.5	44.2	214 32.0	04.8	149 02.1	03.0	128 36.0	102	21 08.4	+ 9
6 00	45 11.0	218 49.3	− 0 57.2	55 57.3	− 6 43.7	229 34.0	+ 3 04.6	164 04.3	−19 03.0	143 05.2	103	−21 07.5	+ 10
01	60 13.4	233 49.0	58.3	70 59.1	43.3	244 36.1	04.4	179 06.5	03.1	157 34.5	103	21 06.5	+ 10
02	75 15.9	248 48.7	0 59.5	86 00.9	42.8	259 38.2	04.3	194 08.6	03.2	172 03.8	103	21 05.5	+ 12
03	90 18.4	263 48.4	· 1 00.6	101 02.7	·· 42.4	274 40.2	·· 04.1	209 10.8	·· 03.2	186 33.1	104	·21 04.3	+ 13
04	105 20.8	278 48.0	01.7	116 04.6	42.0	289 42.3	03.9	224 13.0	03.3	201 02.5	104	21 03.0	+ 14
05	120 23.3	293 47.7	02.9	131 06.4	41.5	304 44.3	03.8	239 15.2	03.3	215 31.9	105	21 01.6	+ 15
06	135 25.8	308 47.4	− 1 04.0	146 08.2	− 6 41.1	319 46.4	+ 3 03.6	254 17.3	−19 03.4	230 01.4	104	−21 00.1	+ 16
07	150 28.2	323 47.0	05.1	161 10.0	40.6	334 48.5	03.4	269 19.5	03.5	244 30.8	106	20 58.5	+ 17
08	165 30.7	338 46.7	06.2	176 11.8	40.2	349 50.5	03.3	284 21.7	03.5	259 00.4	105	20 56.8	+ 18
09	180 33.2	353 46.4	·· 07.4	191 13.6	·· 39.8	4 52.6	·· 03.1	299 23.8	·· 03.6	273 29.9	107	·20 55.0	+ 19
10	195 35.6	8 46.1	08.5	206 15.4	39.3	19 54.6	02.9	314 26.0	03.6	287 59.6	106	20 53.1	+ 21
11	210 38.1	23 45.7	09.6	221 17.2	38.9	34 56.7	02.8	329 28.2	03.7	302 29.2	107	20 51.0	+ 21
12	225 40.6	38 45.4	− 1 10.8	236 19.1	− 6 38.5	49 58.8	+ 3 02.6	344 30.3	−19 03.7	316 58.9	108	−20 48.9	+ 22
13	240 43.0	53 45.1	11.9	251 20.9	38.0	65 00.8	02.4	359 32.5	03.8	331 28.7	107	20 46.7	+ 23
14	255 45.5	68 44.8	13.0	266 22.7	37.6	80 02.9	02.3	14 34.7	03.9	345 58.4	109	20 44.4	+ 25
15	270 47.9	83 44.4	·· 14.2	281 24.5	·· 37.1	95 05.0	·· 02.1	29 36.8	·· 03.9	0 28.3	108	·20 41.9	+ 25
16	285 50.4	98 44.1	15.3	296 26.3	36.7	110 07.0	01.9	44 39.0	04.0	14 58.1	110	20 39.4	+ 26
17	300 52.9	113 43.8	16.4	311 28.1	36.2	125 09.1	01.8	59 41.2	04.0	29 28.1	109	20 36.8	+ 27
18	315 55.3	128 43.4	− 1 17.6	326 29.9	− 6 35.8	140 11.1	+ 3 01.6	74 43.3	−19 04.1	43 58.0	110	−20 34.1	+ 29
19	330 57.8	143 43.1	18.7	341 31.7	35.4	155 13.2	01.4	89 45.5	04.2	58 28.0	111	20 31.2	+ 29
20	346 00.3	158 42.8	19.8	356 33.5	34.9	170 15.3	01.3	104 47.7	04.2	72 58.1	111	20 28.3	+ 30
21	1 02.7	173 42.5	·· 21.0	11 35.3	·· 34.5	185 17.3	·· 01.1	119 49.8	·· 04.3	87 28.2	111	·20 25.3	+ 31
22	16 05.2	188 42.1	22.1	26 37.1	34.0	200 19.4	00.9	134 52.0	04.3	101 58.3	112	20 22.2	+ 32
23	31 07.7	203 41.8	23.2	41 38.9	33.6	215 21.4	00.8	149 54.2	04.4	116 28.5	113	20 19.0	+ 33
7 00	46 10.1	218 41.5	− 1 24.3	56 40.7	− 6 33.1	230 23.5	+ 3 00.6	164 56.3	−19 04.5	130 58.8	112	−20 15.7	+ 34
01	61 12.6	233 41.1	25.5	71 42.5	32.7	245 25.6	00.5	179 58.5	04.5	145 29.0	114	20 12.3	+ 35
02	76 15.0	248 40.8	26.6	86 44.3	32.3	260 27.6	00.3	195 00.7	04.6	159 59.4	114	20 08.8	+ 36
03	91 17.5	263 40.5	·· 27.7	101 46.1	·· 31.8	275 29.7	·· 00.1	210 02.8	·· 04.6	174 29.8	114	·20 05.2	+ 37
04	106 20.0	278 40.1	28.9	116 47.9	31.4	290 31.8	3 00.0	225 05.0	04.7	189 00.2	115	20 01.5	+ 38
05	121 22.4	293 39.8	30.0	131 49.7	30.9	305 33.8	2 59.8	240 07.2	04.7	203 30.7	115	19 57.7	+ 39
06	136 24.9	308 39.5	− 1 31.1	146 51.5	− 6 30.5	320 35.9	+ 2 59.6	255 09.3	−19 04.8	218 01.2	116	−19 53.8	+ 39
07	151 27.4	323 39.2	32.3	161 53.3	30.0	335 38.0	59.5	270 11.5	04.9	232 31.8	116	19 49.9	+ 41
08	166 29.8	338 38.8	33.4	176 55.1	29.6	350 40.0	59.3	285 13.7	04.9	247 02.4	117	19 45.8	+ 41
09	181 32.3	353 38.5	·· 34.5	191 56.9	·· 29.1	5 42.1	·· 59.1	300 15.8	·· 05.0	261 33.1	117	·19 41.7	+ 43
10	196 34.8	8 38.2	35.7	206 58.6	28.7	20 44.1	59.0	315 18.0	05.0	276 03.8	118	19 37.4	+ 43
11	211 37.2	23 37.8	36.8	222 00.4	28.2	35 46.2	58.8	330 20.2	05.1	290 34.6	118	19 33.1	+ 44
12	226 39.7	38 37.5	− 1 37.9	237 02.2	− 6 27.8	50 48.3	+ 2 58.6	345 22.3	−19 05.2	305 05.4	118	−19 28.7	+ 45
13	241 42.2	53 37.2	39.1	252 04.0	27.4	65 50.3	58.5	0 24.5	05.2	319 36.2	120	19 24.2	+ 46
14	256 44.6	68 36.8	40.2	267 05.8	26.9	80 52.4	58.3	15 26.7	05.3	334 07.2	119	19 19.6	+ 47
15	271 47.1	83 36.5	·· 41.3	282 07.6	·· 26.5	95 54.5	·· 58.1	30 28.8	·· 05.3	348 38.1	121	·19 14.9	+ 48
16	286 49.5	98 36.2	42.5	297 09.4	26.0	110 56.5	58.0	45 31.0	05.4	3 09.2	120	19 10.1	+ 48
17	301 52.0	113 35.8	43.6	312 11.2	25.6	125 58.6	57.8	60 33.2	05.5	17 40.2	121	19 05.3	+ 50
18	316 54.5	128 35.5	− 1 44.7	327 12.9	− 6 25.1	141 00.7	+ 2 57.6	75 35.3	−19 05.5	32 11.3	122	−19 00.3	+ 50
19	331 56.9	143 35.2	45.9	342 14.7	24.7	156 02.7	57.5	90 37.5	05.6	46 42.5	122	18 55.3	+ 51
20	346 59.4	158 34.8	47.0	357 16.5	24.2	171 04.8	57.3	105 39.7	05.6	61 13.7	123	18 50.2	+ 52
21	2 01.9	173 34.5	·· 48.1	12 18.3	·· 23.8	186 06.9	·· 57.2	120 41.8	·· 05.7	75 45.0	123	·18 45.0	+ 53
22	17 04.3	188 34.2	49.3	27 20.1	23.3	201 08.9	57.0	135 44.0	05.7	90 16.3	124	18 39.7	+ 53
23	32 06.8	203 33.8	50.4	42 21.8	22.9	216 11.0	56.8	150 46.2	05.8	104 47.7	124	18 34.4	+ 55
24	47 09.3	218 33.5	− 1 51.5	57 23.6	− 6 22.4	231 13.1	+ 2 56.7	165 48.3	−19 05.9	119 19.1	125	−18 28.9	+ 55
code	−	− 3	− 11	+ 18	+ 5	+ 20	− 2	+ 22	− 1				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
5 00	184 05.3	−15 36.5	7	Acamar	315 50.1	−40 28.5
01	199 05.3	37.3	5	Achernar	335 57.7	−57 27.3
02	214 05.3	38.0	30	Acrux	173 57.4	−62 51.5
03	229 05.3	·· 38.8	19	Adhara	255 45.7	−28 54.6
04	244 05.3	39.6	10	Aldebaran	291 37.8	+16 25.5
05	259 05.2	40.3				
06	274 05.2	−15 41.1	32	Alioth	166 58.4	+56 11.5
07	289 05.2	41.9	34	Alkaid	153 32.8	+49 31.6
08	304 05.2	42.6	55	Al Na'ir	28 36.9	−47 10.3
09	319 05.2	·· 43.4	15	Alnilam	276 29.2	− 1 13.6
10	334 05.1	44.1	25	Alphard	218 37.8	− 8 28.2
11	349 05.1	44.9				
12	4 05.1	−15 45.6	41	Alphecca	126 47.3	+26 51.6
13	19 05.1	46.4	1	Alpheratz	358 27.2	+28 51.4
14	34 05.1	47.2	51	Altair	62 49.8	+ 8 45.4
15	49 05.0	·· 47.9	2	Ankaa	353 57.2	−42 32.4
16	64 05.0	48.7	42	Antares	113 18.7	−26 20.2
17	79 05.0	49.4				
18	94 05.0	−15 50.2	37	Arcturus	146 34.8	+19 24.4
19	109 04.9	50.9	43	Atria	108 59.2	−68 57.1
20	124 04.9	51.7	22	Avior	234 35.3	−59 22.0
21	139 04.9	·· 52.4	13	Bellatrix	279 17.3	+ 6 18.7
22	154 04.9	53.2	16	Betelg'se	271 47.0	+ 7 24.0
23	169 04.9	54.0				
			17	Canopus	264 14.7	−52 40.1
6 00	184 04.8	−15 54.7	12	Capella	281 36.8	+45 57.3
01	199 04.8	55.5	53	Deneb	50 00.5	+45 07.9
02	214 04.8	56.2	28	Denebola	183 17.1	+14 48.7
03	229 04.7	·· 57.0	4	Diphda	349 38.2	−18 13.3
04	244 04.7	57.7				
05	259 04.7	58.5	27	Dubhe	194 44.0	+61 58.7
06	274 04.7	−15 59.2	14	Elnath	279 06.0	+28 34.3
07	289 04.6	16 00.0	47	Eltanin	91 06.3	+51 29.9
08	304 04.6	00.7	54	Enif	34 28.7	+ 9 40.8
09	319 04.6	·· 01.5	56	Fomalhaut	16 10.6	−29 51.0
10	334 04.6	02.2				
11	349 04.5	03.0	31	Gacrux	172 48.7	−56 52.2
12	4 04.5	−16 03.7	29	Gienah	176 36.3	−17 18.1
13	19 04.5	04.4	35	Hadar	149 48.8	−60 09.9
14	34 04.4	05.2	6	Hamal	328 48.4	+23 15.7
15	49 04.4	·· 05.9	48	Kaus Aust.	84 40.4	−34 24.4
16	64 04.4	06.7				
17	79 04.3	07.4	40	Kochab	137 19.3	+74 19.9
18	94 04.3	−16 08.2	57	Markab	14 20.5	+14 58.6
19	109 04.3	08.9	8	Menkar	314 59.1	+ 3 55.4
20	124 04.3	09.7	36	Menkent	148 58.1	−36 09.4
21	139 04.2	·· 10.4	24	Miapl'dus	221 48.8	−69 32.1
22	154 04.2	11.1				
23	169 04.2	11.9	9	Mirfak	309 40.7	+49 42.6
			50	Nunki	76 51.1	−26 21.1
7 00	184 04.1	−16 12.6	52	Peacock	54 26.2	−56 52.6
01	199 04.1	13.4	21	Pollux	244 19.5	+28 07.8
02	214 04.0	14.1	20	Procyon	245 44.0	+ 5 20.2
03	229 04.0	·· 14.8				
04	244 04.0	15.6	46	R'alhague	96 46.1	+12 35.6
05	259 03.9	16.3	26	Regulus	208 28.8	+12 10.6
06	274 03.9	−16 17.1	11	Rigel	281 52.6	− 8 14.9
07	289 03.9	17.8	38	Rigil Kent.	140 50.5	−60 39.5
08	304 03.8	18.5	44	Sabik	103 01.6	−15 40.3
09	319 03.8	·· 19.3				
10	334 03.8	20.0	3	Schedar	350 28.5	+56 18.4
11	349 03.7	20.7	45	Shaula	97 19.9	−37 04.4
12	4 03.7	−16 21.5	18	Sirius	259 10.9	−16 39.3
13	19 03.7	22.2	33	Spica	159 16.3	−10 56.1
14	34 03.6	22.9	23	Suhail	223 23.7	−43 15.3
15	49 03.6	·· 23.7				
16	64 03.5	24.4	49	Vega	81 08.0	+38 44.9
17	79 03.5	25.1	39	Zub'g'bi	137 52.8	−15 51.7
18	94 03.5	−16 25.9				
19	109 03.4	26.6				
20	124 03.4	27.3				
21	139 03.3	·· 28.1				
22	154 03.3	28.8				
23	169 03.3	29.5				
24	184 03.2	−16 30.3				
code	—	− 7				

Lat. N °	Sunrise h m	Twlt. begins h m	Moonrise 5 h m	6 h m	7 h m	8 h m
72	9 31	5 04	▬	▬	▬	15 13
70	8 57	5 06	▬	▬	14 45	14 21
68	8 32	5 07	13 04	13 38	13 47	13 49
66	8 14	5 08	12 07	12 50	13 13	13 25
64	7 58	5 08	11 34	12 19	12 48	13 06
62	7 46	5 08	11 10	11 56	12 28	12 50
60	7 35	5 08	10 50	11 37	12 12	12 37
58	7 26	5 08	10 34	11 22	11 58	12 26
56	7 18	5 08	10 21	11 09	11 47	12 16
54	7 10	5 07	10 09	10 57	11 36	12 08
52	7 04	5 06	9 58	10 47	11 27	12 00
50	6 58	5 06	9 49	10 38	11 19	11 53
45	6 45	5 04	9 29	10 19	11 02	11 38
40	6 35	5 02	9 14	10 04	10 47	11 26
35	6 26	4 59	9 00	9 50	10 35	11 15
30	6 18	4 56	8 48	9 39	10 25	11 06
20	6 04	4 48	8 28	9 19	10 06	10 50
10	5 52	4 39	8 11	9 02	9 50	10 36
0	5 40	4 29	7 55	8 46	9 35	10 23
10	5 29	4 16	7 39	8 30	9 20	10 10
20	5 16	3 58	7 21	8 13	9 04	9 56
30	5 02	3 34	7 02	7 53	8 46	9 39
35	4 53	3 19	6 50	7 42	8 35	9 30
40	4 44	3 00	6 37	7 29	8 23	9 19
45	4 32	2 34	6 21	7 13	8 09	9 07
50	4 18	1 57	6 02	6 54	7 51	8 51
52	4 12	1 35	5 53	6 45	7 42	8 44
54	4 05	1 05	5 42	6 35	7 33	8 36
56	3 56	0 01	5 31	6 23	7 22	8 27
58	3 47	////	5 18	6 10	7 10	8 17
60	3 37	////	5 02	5 54	6 56	8 05

Lat. N °	Sunset h m	Twlt. ends h m	Moonset 5 h m	6 h m	7 h m	8 h m
72	13 55	18 18	▬	▬	▬	18 07
70	14 29	18 16	▬	▬	16 58	18 58
68	14 54	18 16	15 10	16 23	17 55	19 30
66	15 13	18 16	16 07	17 10	18 29	19 53
64	15 28	18 16	16 40	17 41	18 53	20 11
62	15 41	18 16	17 05	18 03	19 12	20 26
60	15 51	18 16	17 24	18 22	19 28	20 39
58	16 01	18 17	17 40	18 37	19 41	20 49
56	16 09	18 17	17 54	18 50	19 52	20 59
54	16 16	18 18	18 06	19 01	20 02	21 07
52	16 23	18 19	18 16	19 11	20 11	21 14
50	16 29	18 20	18 25	19 20	20 19	21 21
45	16 42	18 22	18 45	19 39	20 36	21 35
40	16 52	18 24	19 01	19 54	20 50	21 47
35	17 01	18 27	19 14	20 07	21 02	21 56
30	17 09	18 31	19 26	20 19	21 12	22 05
20	17 23	18 38	19 46	20 38	21 29	22 20
10	17 36	18 48	20 03	20 54	21 44	22 33
0	17 47	18 59	20 20	21 10	21 58	22 45
10	17 59	19 13	20 36	21 26	22 13	22 57
20	18 12	19 30	20 53	21 42	22 28	23 09
30	18 26	19 54	21 13	22 01	22 45	23 24
35	18 35	20 10	21 25	22 12	22 55	23 32
40	18 45	20 30	21 38	22 25	23 06	23 42
45	18 56	20 56	21 54	22 40	23 19	23 53
50	19 10	21 35	22 13	22 58	23 35	24 07
52	19 17	21 57	22 22	23 07	23 43	24 13
54	19 24	22 29	22 32	23 16	23 51	24 20
56	19 32	////	22 44	23 27	24 01	0 01
58	19 42	////	22 57	23 39	24 11	0 11
60	19 52	////	23 13	23 54	24 24	0 24

GMT	Equation of Time (App. −Mean) 5 m s	6 m s	7 m s
h			
0	+16 21.3	+16 19.4	+16 16.5
6	+16 20.9	+16 18.7	+16 15.7
12	+16 20.4	+16 18.1	+16 14.8
18	+16 19.9	+16 17.3	+16 13.9
24	+16 19.4	+16 16.5	+16 12.9

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
5	14 07	9 24	20 17	8 44	13 05
6	14 58	9 25	20 14	8 41	13 02
7	15 47	9 25	20 11	8 37	12 58
8	16 34	9 26	20 08	8 34	12 55

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.5	0.1	0.2
30	0.5	0.1	0.2
45	0.5	0.1	0.1
60	0.5	0.0	0.1
75	0.5	0.0	0.0
90			

Moon's Lower Limb Add

Alt. °	5 ′	6 ′	7 ′
0	13.8	13.1	12.6
4	13.8	13.1	12.6
8	13.8	13.2	12.7
12	13.8	13.2	12.7
16	13.8	13.2	12.7
20	13.9	13.3	12.8
24	13.9	13.3	12.9
28	14.0	13.4	12.9
32	14.0	13.5	13.0
36	14.1	13.5	13.1
40	14.1	13.6	13.2
44	14.2	13.7	13.3
48	14.3	13.8	13.4
52	14.3	13.9	13.6
56	14.4	14.0	13.7
60	14.5	14.1	13.8
64	14.6	14.3	14.0
68	14.7	14.4	14.1
72	14.8	14.5	14.3
76	14.9	14.6	14.4
80	15.0	14.8	14.6
84	15.1	14.9	14.8
88	15.1	15.0	14.9
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt. °	5 ′	6 ′	7 ′
0	16.6	16.9	17.2
4	16.6	16.9	17.2
8	16.5	16.9	17.2
12	16.5	16.9	17.2
16	16.5	16.8	17.1
20	16.5	16.8	17.1
24	16.4	16.7	17.0
28	16.4	16.7	16.9
32	16.3	16.6	16.8
36	16.3	16.5	16.7
40	16.2	16.4	16.6
44	16.1	16.4	16.5
48	16.1	16.3	16.4
52	16.0	16.2	16.3
56	15.9	16.0	16.1
60	15.8	15.9	16.0
64	15.7	15.8	15.9
68	15.6	15.7	15.7
72	15.6	15.6	15.6
76	15.5	15.4	15.4
80	15.4	15.3	15.2
84	15.3	15.2	15.1
88	15.2	15.1	15.0
90			

Subtract from table, back cover

General Election Day 6

GMT	♈ GHA	VENUS −3.5 GHA	Dec.	MARS −1.0 GHA	Dec.	JUPITER −1.4 GHA	Dec.	SATURN 0.7 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
8 00	47 09.3	218 33.5	− 1 51.5	57 23.6	− 6 22.4	231 13.1	+ 2 56.7	165 48.3	−19 05.9	119 19.1	125	−18 28.9	+ 55
01	62 11.7	233 33.2	52.7	72 25.4	22.0	246 15.1	56.5	180 50.5	05.9	133 50.6	125	18 23.4	+ 56
02	77 14.2	248 32.8	53.8	87 27.2	21.5	261 17.2	56.3	195 52.7	06.0	148 22.1	125	18 17.8	+ 57
03	92 16.7	263 32.5	.. 54.9	102 28.9	.. 21.1	276 19.3	.. 56.2	210 54.8	.. 06.0	162 53.6	127	·18 12.1	+ 58
04	107 19.1	278 32.2	56.1	117 30.7	20.6	291 21.3	56.0	225 57.0	06.1	177 25.3	126	18 06.3	+ 58
05	122 21.6	293 31.8	57.2	132 32.5	20.2	306 23.4	55.8	240 59.2	06.2	191 56.9	127	18 00.5	+ 59
06	137 24.0	308 31.5	− 1 58.3	147 34.3	− 6 19.7	321 25.5	+ 2 55.7	256 01.3	−19 06.2	206 28.6	128	−17 54.6	+ 60
07	152 26.5	323 31.2	1 59.5	162 36.0	19.3	336 27.5	55.5	271 03.5	06.3	221 00.4	128	17 48.6	+ 61
08	167 29.0	338 30.8	2 00.6	177 37.8	18.8	351 29.6	55.4	286 05.7	06.3	235 32.2	129	17 42.5	+ 61
09	182 31.4	353 30.5	.. 01.7	192 39.6	.. 18.3	6 31.7	.. 55.2	301 07.8	.. 06.4	250 04.1	129	·17 36.4	+ 63
10	197 33.9	8 30.2	02.9	207 41.4	17.9	21 33.7	55.0	316 10.0	06.5	264 36.0	129	17 30.1	+ 63
11	212 36.4	23 29.8	04.0	222 43.1	17.4	36 35.8	54.9	331 12.2	06.5	279 07.9	130	17 23.8	+ 64
12	227 38.8	38 29.5	− 2 05.1	237 44.9	− 6 17.0	51 37.9	+ 2 54.7	346 14.3	−19 06.6	293 39.9	131	−17 17.4	+ 64
13	242 41.3	53 29.2	06.3	252 46.7	16.5	66 39.9	54.5	1 16.5	06.6	308 12.0	131	17 11.0	+ 65
14	257 43.8	68 28.8	07.4	267 48.4	16.1	81 42.0	54.4	16 18.7	06.7	322 44.1	131	17 04.5	+ 66
15	272 46.2	83 28.5	.. 08.5	282 50.2	.. 15.6	96 44.1	.. 54.2	31 20.8	.. 06.7	337 16.2	132	·16 57.9	+ 67
16	287 48.7	98 28.2	09.7	297 52.0	15.2	111 46.1	54.1	46 23.0	06.8	351 48.4	133	16 51.2	+ 67
17	302 51.1	113 27.8	10.8	312 53.7	14.7	126 48.2	53.9	61 25.2	06.9	6 20.7	132	16 44.5	+ 68
18	317 53.6	128 27.5	− 2 12.0	327 55.5	− 6 14.3	141 50.3	+ 2 53.7	76 27.3	−19 06.9	20 52.9	134	−16 37.7	+ 69
19	332 56.1	143 27.2	13.1	342 57.2	13.8	156 52.4	53.6	91 29.5	07.0	35 25.3	134	16 30.8	+ 70
20	347 58.5	158 26.8	14.2	357 59.0	13.3	171 54.4	53.4	106 31.7	07.0	49 57.7	134	16 23.8	+ 70
21	3 01.0	173 26.5	.. 15.4	13 00.8	.. 12.9	186 56.5	.. 53.2	121 33.8	.. 07.1	64 30.1	134	·16 16.8	+ 71
22	18 03.5	188 26.1	16.5	28 02.5	12.4	201 58.6	53.1	136 36.0	07.2	79 02.5	136	16 09.7	+ 71
23	33 05.9	203 25.8	17.6	43 04.3	12.0	217 00.6	52.9	151 38.2	07.2	93 35.1	135	16 02.6	+ 73
9 00	48 08.4	218 25.5	− 2 18.8	58 06.0	− 6 11.5	232 02.7	+ 2 52.8	166 40.3	−19 07.3	108 07.6	136	−15 55.3	+ 72
01	63 10.9	233 25.1	19.9	73 07.8	11.1	247 04.8	52.6	181 42.5	07.3	122 40.2	137	15 48.1	+ 74
02	78 13.3	248 24.8	21.0	88 09.6	10.6	262 06.8	52.4	196 44.7	07.4	137 12.9	136	15 40.7	+ 74
03	93 15.8	263 24.5	.. 22.2	103 11.3	.. 10.1	277 08.9	.. 52.3	211 46.8	.. 07.4	151 45.5	138	·15 33.3	+ 75
04	108 18.3	278 24.1	23.3	118 13.1	09.7	292 11.0	52.1	226 49.0	07.5	166 18.3	137	15 25.8	+ 76
05	123 20.7	293 23.8	24.4	133 14.8	09.2	307 13.1	51.9	241 51.1	07.6	180 51.0	139	15 18.2	+ 76
06	138 23.2	308 23.4	− 2 25.6	148 16.6	− 6 08.8	322 15.1	+ 2 51.8	256 53.3	−19 07.6	195 23.9	138	−15 10.6	+ 77
07	153 25.6	323 23.1	26.7	163 18.3	08.3	337 17.2	51.6	271 55.5	07.7	209 56.7	139	15 02.9	+ 77
08	168 28.1	338 22.8	27.8	178 20.1	07.9	352 19.3	51.5	286 57.6	07.7	224 29.6	140	14 55.2	+ 78
09	183 30.6	353 22.4	.. 29.0	193 21.8	.. 07.4	7 21.3	.. 51.3	301 59.8	.. 07.8	239 02.6	139	·14 47.4	+ 79
10	198 33.0	8 22.1	30.1	208 23.6	06.9	22 23.4	51.1	317 02.0	07.9	253 35.5	140	14 39.5	+ 79
11	213 35.5	23 21.7	31.2	223 25.3	06.5	37 25.5	51.0	332 04.1	07.9	268 08.5	141	14 31.6	+ 80
12	228 38.0	38 21.4	− 2 32.4	238 27.1	− 6 06.0	52 27.6	+ 2 50.8	347 06.3	−19 08.0	282 41.6	141	−14 23.6	+ 80
13	243 40.4	53 21.1	33.5	253 28.8	05.6	67 29.6	50.6	2 08.5	08.0	297 14.7	141	14 15.6	+ 81
14	258 42.9	68 20.7	34.7	268 30.6	05.1	82 31.7	50.5	17 10.6	08.1	311 47.8	142	14 07.5	+ 82
15	273 45.4	83 20.4	.. 35.8	283 32.3	.. 04.6	97 33.8	.. 50.3	32 12.8	.. 08.1	326 21.0	142	·13 59.3	+ 82
16	288 47.8	98 20.1	36.9	298 34.1	04.2	112 35.8	50.2	47 15.0	08.2	340 54.2	143	13 51.1	+ 83
17	303 50.3	113 19.7	38.1	313 35.8	03.7	127 37.9	50.0	62 17.1	08.3	355 27.5	142	13 42.8	+ 83
18	318 52.8	128 19.4	− 2 39.2	328 37.6	− 6 03.3	142 40.0	+ 2 49.8	77 19.3	−19 08.3	10 00.7	144	−13 34.5	+ 84
19	333 55.2	143 19.0	40.3	343 39.3	02.8	157 42.1	49.7	92 21.5	08.4	24 34.1	143	13 26.1	+ 84
20	348 57.7	158 18.7	41.5	358 41.0	02.3	172 44.1	49.5	107 23.6	08.4	39 07.4	144	13 17.7	+ 85
21	4 00.1	173 18.3	.. 42.6	13 42.8	.. 01.9	187 46.2	.. 49.4	122 25.8	.. 08.5	53 40.8	144	·13 09.2	+ 86
22	19 02.6	188 18.0	43.7	28 44.5	01.4	202 48.3	49.2	137 27.9	08.6	68 14.2	145	13 00.6	+ 86
23	34 05.1	203 17.7	44.9	43 46.3	00.9	217 50.4	49.0	152 30.1	08.6	82 47.7	145	12 52.0	+ 86
10 00	49 07.5	218 17.3	− 2 46.0	58 48.0	− 6 00.5	232 52.4	+ 2 48.9	167 32.3	−19 08.7	97 21.2	145	−12 43.4	+ 88
01	64 10.0	233 17.0	47.1	73 49.7	6 00.0	247 54.5	48.7	182 34.4	08.7	111 54.7	145	12 34.6	+ 87
02	79 12.5	248 16.6	48.3	88 51.5	5 59.6	262 56.6	48.6	197 36.6	08.8	126 28.2	146	12 25.9	+ 88
03	94 14.9	263 16.3	.. 49.4	103 53.2	.. 59.1	277 58.6	.. 48.4	212 38.8	.. 08.8	141 01.8	146	·12 17.1	+ 89
04	109 17.4	278 16.0	50.6	118 54.9	58.6	293 00.7	48.2	227 40.9	08.9	155 35.4	147	12 08.2	+ 89
05	124 19.9	293 15.6	51.7	133 56.7	58.2	308 02.8	48.1	242 43.1	09.0	170 09.1	146	11 59.3	+ 90
06	139 22.3	308 15.3	− 2 52.8	148 58.4	− 5 57.7	323 04.9	+ 2 47.9	257 45.3	−19 09.0	184 42.7	147	−11 50.3	+ 90
07	154 24.8	323 14.9	54.0	164 00.1	57.2	338 06.9	47.8	272 47.4	09.1	199 16.4	148	11 41.3	+ 91
08	169 27.3	338 14.6	55.1	179 01.9	56.8	353 09.0	47.6	287 49.6	09.1	213 50.2	147	11 32.2	+ 91
09	184 29.7	353 14.2	.. 56.2	194 03.6	.. 56.3	8 11.1	.. 47.4	302 51.8	.. 09.2	228 23.9	148	·11 23.1	+ 92
10	199 32.2	8 13.9	57.4	209 05.3	55.8	23 13.2	47.3	317 53.9	09.3	242 57.7	148	11 13.9	+ 92
11	214 34.6	23 13.6	58.5	224 07.1	55.4	38 15.2	47.1	332 56.1	09.3	257 31.5	148	11 04.7	+ 92
12	229 37.1	38 13.2	− 2 59.6	239 08.8	− 5 54.9	53 17.3	+ 2 47.0	347 58.2	−19 09.4	272 05.3	149	−10 55.5	+ 93
13	244 39.6	53 12.9	3 00.8	254 10.5	54.4	68 19.4	46.8	3 00.4	09.4	286 39.2	149	10 46.2	+ 94
14	259 42.0	68 12.5	01.9	269 12.3	54.0	83 21.5	46.6	18 02.6	09.5	301 13.1	149	10 36.8	+ 94
15	274 44.5	83 12.2	.. 03.0	284 14.0	.. 53.5	98 23.5	.. 46.5	33 04.7	.. 09.5	315 47.0	149	·10 27.4	+ 94
16	289 47.0	98 11.8	04.2	299 15.7	53.0	113 25.6	46.3	48 06.9	09.6	330 20.9	149	10 18.0	+ 95
17	304 49.4	113 11.5	05.3	314 17.4	52.6	128 27.7	46.2	63 09.1	09.7	344 54.8	150	10 08.5	+ 95
18	319 51.9	128 11.1	− 3 06.5	329 19.2	− 5 52.1	143 29.8	+ 2 46.0	78 11.2	−19 09.7	359 28.8	150	− 9 59.0	+ 96
19	334 54.4	143 10.8	07.6	344 20.9	51.6	158 31.8	45.8	93 13.4	09.8	14 02.8	150	9 49.4	+ 96
20	349 56.8	158 10.5	08.7	359 22.6	51.2	173 33.9	45.7	108 15.6	09.8	28 36.8	150	9 39.8	+ 96
21	4 59.3	173 10.1	.. 09.9	14 24.3	.. 50.7	188 36.0	.. 45.5	123 17.7	.. 09.9	43 10.8	151	· 9 30.2	+ 97
22	20 01.7	188 09.8	11.0	29 26.0	50.2	203 38.1	45.4	138 19.9	10.0	57 44.9	150	9 20.5	+ 98
23	35 04.2	203 09.4	12.1	44 27.8	49.8	218 40.2	45.2	153 22.0	10.0	72 18.9	151	9 10.7	+ 97
24	50 06.7	218 09.1	− 3 13.3	59 29.5	− 5 49.3	233 42.2	+ 2 45.0	168 24.2	−19 10.1	86 53.0	151	− 9 01.0	+ 98
code	—	− 3	− 11	+ 17	+ 4	+ 20	− 2	+ 22	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
8 00	184 03.2	−16 30.3
01	199 03.2	31.0
02	214 03.1	31.7
03	229 03.1	32.5
04	244 03.0	33.2
05	259 03.0	33.9
06	274 02.9	−16 34.6
07	289 02.9	35.4
08	304 02.9	36.1
09	319 02.8	36.8
10	334 02.8	37.5
11	349 02.7	38.3
12	4 02.7	−16 39.0
13	19 02.6	39.7
14	34 02.6	40.4
15	49 02.5	41.2
16	64 02.5	41.9
17	79 02.4	42.6
18	94 02.4	−16 43.3
19	109 02.3	44.0
20	124 02.3	44.8
21	139 02.2	45.5
22	154 02.2	46.2
23	169 02.1	46.9
9 00	184 02.1	−16 47.6
01	199 02.0	48.3
02	214 02.0	49.1
03	229 01.9	49.8
04	244 01.9	50.5
05	259 01.8	51.2
06	274 01.8	−16 51.9
07	289 01.7	52.6
08	304 01.7	53.4
09	319 01.6	54.1
10	334 01.6	54.8
11	349 01.5	55.5
12	4 01.5	−16 56.2
13	19 01.4	56.9
14	34 01.3	57.6
15	49 01.3	58.3
16	64 01.2	59.1
17	79 01.2	16 59.8
18	94 01.1	−17 00.5
19	109 01.1	01.2
20	124 01.0	01.9
21	139 00.9	02.6
22	154 00.9	03.3
23	169 00.8	04.0
10 00	184 00.8	−17 04.7
01	199 00.7	05.4
02	214 00.6	06.1
03	229 00.6	06.8
04	244 00.5	07.5
05	259 00.5	08.2
06	274 00.4	−17 08.9
07	289 00.3	09.6
08	304 00.3	10.3
09	319 00.2	11.0
10	334 00.2	11.7
11	349 00.1	12.4
12	4 00.0	−17 13.1
13	19 00.0	13.8
14	33 59.9	14.5
15	48 59.8	15.2
16	63 59.8	15.9
17	78 59.7	16.6
18	93 59.6	−17 17.3
19	108 59.6	18.0
20	123 59.5	18.7
21	138 59.4	19.4
22	153 59.4	20.1
23	168 59.3	20.8
24	183 59.2	−17 21.5
code	—	− 7

No.	Name	STARS SHA	STARS Dec.
		° ′	° ′
7	Acamar	315 50.1	−40 28.5
5	Achernar	335 57.8	−57 27.3
30	Acrux	173 57.3	−62 51.5
19	Adhara	255 45.7	−28 54.6
10	Aldebaran	291 37.8	+16 25.5
32	Alioth	166 58.4	+56 11.4
34	Alkaid	153 32.8	+49 31.6
55	Al Na'ir	28 36.9	−47 10.3
15	Alnilam	276 29.2	− 1 13.6
25	Alphard	218 37.8	− 8 28.2
41	Alphecca	126 47.3	+26 51.6
1	Alpheratz	358 27.2	+28 51.4
51	Altair	62 49.8	+ 8 45.4
2	Ankaa	353 57.2	−42 32.4
42	Antares	113 18.7	−26 20.2
37	Arcturus	146 34.8	+19 24.4
43	Atria	108 59.2	−68 57.1
22	Avior	234 35.2	−59 22.0
13	Bellatrix	279 17.3	+ 6 18.7
16	Betelg'se	271 47.0	+ 7 24.0
17	Canopus	264 14.6	−52 40.1
12	Capella	281 36.8	+45 57.3
53	Deneb	50 00.5	+45 07.9
28	Denebola	183 17.1	+14 48.7
4	Diphda	349 38.2	−18 13.3
27	Dubhe	194 44.0	+61 58.7
14	Elnath	279 06.0	+28 34.3
47	Eltanin	91 06.3	+51 29.9
54	Enif	34 28.8	+ 9 40.8
56	Fomalhaut	16 10.6	−29 51.0
31	Gacrux	172 48.7	−56 52.1
29	Gienah	176 36.3	−17 18.1
35	Hadar	149 48.8	−60 09.8
6	Hamal	328 48.4	+23 15.7
48	Kaus Aust.	84 40.4	−34 24.4
40	Kochab	137 19.3	+74 19.9
57	Markab	14 20.5	+14 58.6
8	Menkar	314 59.1	+ 3 55.4
36	Menkent	148 58.1	−36 09.4
24	Miapl'dus	221 48.7	−69 32.1
9	Mirfak	309 40.7	+49 42.6
50	Nunki	76 51.1	−26 21.1
52	Peacock	54 26.2	−56 52.6
21	Pollux	244 19.4	+28 07.8
20	Procyon	245 44.0	+ 5 20.2
46	R'alhague	96 46.1	+12 35.6
26	Regulus	208 28.7	+12 10.6
11	Rigel	281 52.6	− 8 14.9
38	Rigil Kent.	140 50.5	−60 39.5
44	Sabik	103 01.6	−15 40.3
3	Schedar	350 28.5	+56 18.4
45	Shaula	97 19.9	−37 04.4
18	Sirius	259 10.9	−16 39.3
33	Spica	159 16.3	−10 56.1
23	Suhail	223 23.7	−43 15.3
49	Vega	81 08.0	+38 44.9
39	Zub'g'bi	137 52.8	−15 51.7

Lat. N°	Sunrise h m	Twlt. begins h m
72	9 54	5 15
70	9 13	5 16
68	8 46	5 16
66	8 25	5 16
64	8 08	5 15
62	7 54	5 15
60	7 43	5 14
58	7 33	5 13
56	7 24	5 13
54	7 16	5 12
52	7 09	5 12
50	7 03	5 10
45	6 49	5 07
40	6 38	5 04
35	6 29	5 02
30	6 20	4 57
20	6 05	4 50
10	5 53	4 40
0	5 40	4 28
10	5 28	4 14
20	5 15	3 56
30	4 59	3 32
35	4 50	3 15
40	4 40	2 55
45	4 28	2 27
50	4 13	1 47
52	4 06	1 22
54	3 59	0 45
56	3 50	////
58	3 40	////
60	3 29	////

Lat. N°	Sunset h m	Twlt. ends h m
72	13 32	18 08
70	14 14	18 08
68	14 41	18 08
66	15 02	18 08
64	15 19	18 09
62	15 33	18 10
60	15 44	18 10
58	15 54	18 11
56	16 03	18 12
54	16 11	18 14
52	16 18	18 15
50	16 24	18 15
45	16 38	18 19
40	16 49	18 22
35	16 59	18 26
30	17 07	18 29
20	17 22	18 38
10	17 35	18 48
0	17 47	18 59
10	18 00	19 14
20	18 13	19 32
30	18 29	19 58
35	18 38	20 14
40	18 48	20 35
45	19 01	21 04
50	19 16	21 46
52	19 23	22 11
54	19 30	22 51
56	19 39	////
58	19 49	////
60	20 01	////

Lat. N°	Moonrise 8 h m	9 h m	10 h m	11 h m
72	15 13	14 37	14 17	14 02
70	14 21	14 09	14 00	13 53
68	13 49	13 48	13 47	13 45
66	13 25	13 32	13 36	13 38
64	13 06	13 18	13 26	13 33
62	12 50	13 06	13 18	13 28
60	12 37	12 56	13 11	13 24
58	12 26	12 48	13 05	13 20
56	12 16	12 40	13 00	13 17
54	12 08	12 33	12 55	13 14
52	12 00	12 27	12 50	13 11
50	11 53	12 21	12 46	13 08
45	11 38	12 10	12 37	13 03
40	11 26	12 00	12 30	12 58
35	11 15	11 51	12 24	12 54
30	11 06	11 43	12 18	12 51
20	10 50	11 30	12 08	12 45
10	10 36	11 19	12 00	12 40
0	10 23	11 08	11 52	12 35
10	10 10	10 57	11 44	12 29
20	9 56	10 46	11 35	12 24
30	9 39	10 33	11 25	12 18
35	9 30	10 25	11 20	12 14
40	9 19	10 16	11 13	12 10
45	9 07	10 06	11 06	12 06
50	8 51	9 53	10 56	12 00
52	8 44	9 48	10 52	11 57
54	8 36	9 41	10 48	11 55
56	8 27	9 34	10 42	11 51
58	8 17	9 26	10 37	11 48
60	8 05	9 17	10 30	11 44

Lat. N°	Moonset 8 h m	9 h m	10 h m	11 h m
72	18 07	20 16	22 06	23 50
70	18 58	20 43	22 22	23 58
68	19 30	21 03	22 34	24 04
66	19 53	21 19	22 44	24 09
64	20 11	21 31	22 52	24 13
62	20 26	21 42	22 59	24 16
60	20 39	21 51	23 05	24 20
58	20 49	21 59	23 11	24 22
56	20 59	22 06	23 15	24 25
54	21 07	22 13	23 20	24 27
52	21 14	22 18	23 23	24 29
50	21 21	22 24	23 27	24 31
45	21 35	22 34	23 34	24 35
40	21 47	22 43	23 41	24 38
35	21 56	22 51	23 46	24 41
30	22 05	22 58	23 51	24 43
20	22 20	23 10	23 59	24 48
10	22 33	23 20	24 06	0 06
0	22 45	23 29	24 12	0 12
10	22 57	23 39	24 19	0 19
20	23 09	23 49	24 26	0 26
30	23 24	24 00	0 00	0 34
35	23 32	24 07	0 07	0 38
40	23 42	24 14	0 14	0 43
45	23 53	24 23	0 23	0 49
50	24 07	0 07	0 33	0 56
52	24 13	0 13	0 38	1 00
54	24 20	0 20	0 43	1 03
56	0 01	0 27	0 49	1 07
58	0 11	0 36	0 55	1 11
60	0 24	0 46	1 02	1 16

GMT	Equation of Time (App. − Mean) 8 m s	9 m s	10 m s
h			
0	+16 12.9	+16 08.5	+16 03.2
6	+16 11.9	+16 07.2	+16 01.7
12	+16 10.8	+16 05.9	+16 00.2
18	+16 09.7	+16 04.6	+15 58.7
24	+16 08.5	+16 03.2	+15 57.1

DAY	GMT of Transit Meridian of Greenwich: Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
8	16 34	9 26	20 08	8 34	12 55
9	17 19	9 27	20 05	8 31	12 52
10	18 02	9 27	20 03	8 27	12 48
11	18 45	9 28	20 00	8 24	12 45

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.5	0.1	0.2
30	0.5	0.1	0.2
45	0.5	0.1	0.1
60	0.5	0.1	0.1
75	0.5	0.0	0.1
90	0.5	0.0	0.0

Moon's Lower Limb Add

Alt.	8	9	10
°	′	′	′
0	12.2	12.0	12.1
4	12.3	12.0	12.1
8	12.3	12.0	12.2
12	12.3	12.1	12.2
16	12.4	12.1	12.2
20	12.4	12.2	12.3
24	12.5	12.3	12.4
28	12.6	12.4	12.5
32	12.7	12.5	12.6
36	12.8	12.6	12.7
40	12.9	12.7	12.8
44	13.0	12.8	12.9
48	13.2	13.0	13.1
52	13.3	13.1	13.2
56	13.5	13.3	13.4
60	13.6	13.5	13.5
64	13.8	13.6	13.7
68	14.0	13.8	13.9
72	14.1	14.0	14.1
76	14.3	14.2	14.3
80	14.5	14.4	14.4
84	14.7	14.6	14.6
88	14.8	14.7	14.8
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	8	9	10
°	′	′	′
0	17.4	17.6	17.5
4	17.4	17.6	17.5
8	17.4	17.5	17.5
12	17.4	17.5	17.4
16	17.3	17.5	17.4
20	17.3	17.4	17.3
24	17.2	17.3	17.2
28	17.1	17.2	17.2
32	17.0	17.1	17.1
36	16.9	17.0	16.9
40	16.8	16.9	16.8
44	16.6	16.7	16.7
48	16.5	16.6	16.6
52	16.4	16.4	16.4
56	16.2	16.3	16.2
60	16.1	16.1	16.1
64	15.9	15.9	15.9
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.2
84	15.0	15.0	15.0
88	14.9	14.8	14.9
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.5 GHA	VENUS −3.5 Dec.	MARS −0.9 GHA	MARS −0.9 Dec.	JUPITER −1.4 GHA	JUPITER −1.4 Dec.	SATURN 0.7 GHA	SATURN 0.7 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
11 0	50 06.7	218 09.1	− 3 13.3	59 29.5	− 5 49.3	233 42.2	+ 2 45.0	168 24.2	−19 10.1	86 53.0	151	− 9 01.0	+ 98
1	65 09.1	233 08.7	14.4	74 31.2	48.8	248 44.3	44.9	183 26.4	10.1	101 27.1	151	8 51.2	+ 99
2	80 11.6	248 08.4	15.5	89 32.9	48.4	263 46.4	44.7	198 28.5	10.2	116 01.2	152	8 41.3	+ 99
3	95 14.1	263 08.0	·· 16.7	104 34.6	·· 47.9	278 48.5	·· 44.6	213 30.7	·· 10.2	130 35.4	151	· 8 31.4	+ 99
4	110 16.5	278 07.7	17.8	119 36.4	47.4	293 50.5	44.4	228 32.9	10.3	145 09.5	152	8 21.5	+100
5	125 19.0	293 07.3	18.9	134 38.1	46.9	308 52.6	44.2	243 35.0	10.4	159 43.7	151	8 11.5	+100
6	140 21.5	308 07.0	− 3 20.1	149 39.8	− 5 46.5	323 54.7	+ 2 44.1	258 37.2	−19 10.4	174 17.8	152	− 8 01.5	+100
7	155 23.9	323 06.6	21.2	164 41.5	46.0	338 56.8	43.9	273 39.3	10.5	188 52.0	152	7 51.5	+101
8	170 26.4	338 06.3	22.4	179 43.2	45.5	353 58.9	43.8	288 41.5	10.5	203 26.2	152	7 41.4	+101
9	185 28.9	353 05.9	·· 23.5	194 44.9	·· 45.1	9 00.9	·· 43.6	303 43.7	·· 10.6	218 00.4	152	· 7 31.3	+101
10	200 31.3	8 05.6	24.6	209 46.6	44.6	24 03.0	43.4	318 45.8	10.7	232 34.6	152	7 21.2	+102
11	215 33.8	23 05.2	25.8	224 48.3	44.1	39 05.1	43.3	333 48.0	10.7	247 08.8	152	7 11.0	+102
12	230 36.2	38 04.9	− 3 26.9	239 50.1	− 5 43.6	54 07.2	+ 2 43.1	348 50.2	−19 10.8	261 43.0	153	− 7 00.8	+103
13	245 38.7	53 04.6	28.0	254 51.8	43.2	69 09.2	43.0	3 52.3	10.8	276 17.3	152	6 50.5	+102
14	260 41.2	68 04.2	29.2	269 53.5	42.7	84 11.3	42.8	18 54.5	10.9	290 51.5	152	6 40.3	+104
15	275 43.6	83 03.9	·· 30.3	284 55.2	·· 42.2	99 13.4	·· 42.7	33 56.7	·· 10.9	305 25.7	153	· 6 29.9	+103
16	290 46.1	98 03.5	31.4	299 56.9	41.8	114 15.5	42.5	48 58.8	11.0	320 00.0	152	6 19.6	+104
17	305 48.6	113 03.2	32.6	314 58.6	41.3	129 17.6	42.3	64 01.0	11.1	334 34.2	153	6 09.2	+104
18	320 51.0	128 02.8	− 3 33.7	330 00.3	− 5 40.8	144 19.6	+ 2 42.2	79 03.1	−19 11.1	349 08.5	153	− 5 58.8	+104
19	335 53.5	143 02.5	34.8	345 02.0	40.3	159 21.7	42.0	94 05.3	11.2	3 42.8	152	5 48.4	+105
20	350 56.0	158 02.1	36.0	0 03.7	39.9	174 23.8	41.9	109 07.5	11.2	18 17.0	153	5 37.9	+105
21	5 58.4	173 01.8	·· 37.1	15 05.4	·· 39.4	189 25.9	·· 41.7	124 09.6	·· 11.3	32 51.3	152	· 5 27.4	+105
22	21 00.9	188 01.4	38.3	30 07.1	38.9	204 28.0	41.6	139 11.8	11.4	47 25.5	153	5 16.9	+105
23	36 03.4	203 01.1	39.4	45 08.8	38.4	219 30.0	41.4	154 14.0	11.4	61 59.8	152	5 06.4	+106
12 0	51 05.8	218 00.7	− 3 40.5	60 10.5	− 5 38.0	234 32.1	+ 2 41.2	169 16.1	−19 11.5	76 34.0	153	− 4 55.8	+106
1	66 08.3	233 00.4	41.7	75 12.2	37.5	249 34.2	41.1	184 18.3	11.5	91 08.3	152	4 45.2	+106
2	81 10.7	248 00.0	42.8	90 13.9	37.0	264 36.3	40.9	199 20.4	11.6	105 42.5	153	4 34.6	+107
3	96 13.2	262 59.7	·· 43.9	105 15.6	·· 36.5	279 38.4	·· 40.8	214 22.6	·· 11.6	120 16.8	152	· 4 23.9	+106
4	111 15.7	277 59.3	45.1	120 17.3	36.1	294 40.4	40.6	229 24.8	11.7	134 51.0	153	4 13.3	+107
5	126 18.1	292 58.9	46.2	135 19.0	35.6	309 42.5	40.5	244 26.9	11.8	149 25.3	152	4 02.6	+107
6	141 20.6	307 58.6	− 3 47.3	150 20.7	− 5 35.1	324 44.6	+ 2 40.3	259 29.1	−19 11.8	163 59.5	152	− 3 51.9	+108
7	156 23.1	322 58.2	48.5	165 22.4	34.6	339 46.7	40.1	274 31.2	11.9	178 33.7	152	3 41.1	+108
8	171 25.5	337 57.9	49.6	180 24.1	34.2	354 48.8	40.0	289 33.4	11.9	193 07.9	152	3 30.3	+108
9	186 28.0	352 57.5	·· 50.7	195 25.8	·· 33.7	9 50.9	·· 39.8	304 35.6	·· 12.0	207 42.1	152	· 3 19.5	+108
10	201 30.5	7 57.2	51.9	210 27.5	33.2	24 52.9	39.7	319 37.7	12.0	222 16.3	152	3 08.7	+108
11	216 32.9	22 56.8	53.0	225 29.2	32.7	39 55.0	39.5	334 39.9	12.1	236 50.5	152	2 57.9	+108
12	231 35.4	37 56.5	− 3 54.1	240 30.9	− 5 32.2	54 57.1	+ 2 39.4	349 42.1	−19 12.2	251 24.7	151	− 2 47.1	+109
13	246 37.8	52 56.1	55.3	255 32.6	31.8	69 59.2	39.2	4 44.2	12.2	265 58.8	152	2 36.2	+109
14	261 40.3	67 55.8	56.4	270 34.2	31.3	85 01.3	39.0	19 46.4	12.3	280 33.0	151	2 25.3	+109
15	276 42.8	82 55.4	·· 57.6	285 35.9	·· 30.8	100 03.4	·· 38.9	34 48.5	·· 12.3	295 07.1	151	· 2 14.4	+109
16	291 45.2	97 55.1	58.7	300 37.6	30.3	115 05.4	38.7	49 50.7	12.4	309 41.2	151	2 03.5	+110
17	306 47.7	112 54.7	3 59.8	315 39.3	29.9	130 07.5	38.6	64 52.9	12.5	324 15.3	151	1 52.5	+109
18	321 50.2	127 54.4	− 4 01.0	330 41.0	− 5 29.4	145 09.6	+ 2 38.4	79 55.0	−19 12.5	338 49.4	150	− 1 41.6	+110
19	336 52.6	142 54.0	02.1	345 42.7	28.9	160 11.7	38.3	94 57.2	12.6	353 23.4	151	1 30.6	+110
20	351 55.1	157 53.6	03.2	0 44.4	28.4	175 13.8	38.1	109 59.4	12.6	7 57.5	150	1 19.6	+110
21	6 57.6	172 53.3	·· 04.4	15 46.1	·· 27.9	190 15.9	·· 37.9	125 01.5	·· 12.7	22 31.5	150	· 1 08.6	+110
22	22 00.0	187 52.9	05.5	30 47.7	27.5	205 17.9	37.8	140 03.7	12.7	37 05.5	150	0 57.6	+111
23	37 02.5	202 52.6	06.6	45 49.4	27.0	220 20.0	37.6	155 05.8	12.8	51 39.5	149	0 46.5	+110
13 0	52 05.0	217 52.2	− 4 07.8	60 51.1	− 5 26.5	235 22.1	+ 2 37.5	170 08.0	−19 12.9	66 13.4	150	− 0 35.5	+111
1	67 07.4	232 51.9	08.9	75 52.8	26.0	250 24.2	37.3	185 10.2	12.9	80 47.4	149	0 24.4	+110
2	82 09.9	247 51.5	10.0	90 54.5	25.5	265 26.3	37.2	200 12.3	13.0	95 21.3	149	0 13.4	+111
3	97 12.3	262 51.1	·· 11.2	105 56.2	·· 25.1	280 28.4	·· 37.0	215 14.5	·· 13.0	109 55.2	148	− 0 02.3	+111
4	112 14.8	277 50.8	12.3	120 57.8	24.6	295 30.4	36.9	230 16.6	13.1	124 29.0	149	+ 0 08.8	+111
5	127 17.3	292 50.4	13.4	135 59.5	24.1	310 32.5	36.7	245 18.8	13.1	139 02.9	148	0 19.9	+111
6	142 19.7	307 50.1	− 4 14.6	151 01.2	− 5 23.6	325 34.6	+ 2 36.5	260 21.0	−19 13.2	153 36.7	148	+ 0 31.0	+111
7	157 22.2	322 49.7	15.7	166 02.9	23.1	340 36.7	36.4	275 23.1	13.3	168 10.5	147	0 42.1	+111
8	172 24.7	337 49.4	16.8	181 04.5	22.6	355 38.8	36.2	290 25.3	13.3	182 44.2	147	0 53.2	+112
9	187 27.1	352 49.0	·· 18.0	196 06.2	·· 22.2	10 40.9	·· 36.1	305 27.5	·· 13.4	197 17.9	147	· 1 04.4	+111
10	202 29.6	7 48.6	19.1	211 07.9	21.7	25 43.0	35.9	320 29.6	13.4	211 51.6	147	1 15.5	+112
11	217 32.1	22 48.3	20.2	226 09.6	21.2	40 45.1	35.8	335 31.8	13.5	226 25.3	146	1 26.7	+111
12	232 34.5	37 47.9	− 4 21.4	241 11.2	− 5 20.7	55 47.1	+ 2 35.6	350 33.9	−19 13.6	240 58.9	146	+ 1 37.8	+112
13	247 37.0	52 47.6	22.5	256 12.9	20.2	70 49.2	35.5	5 36.1	13.6	255 32.5	145	1 49.0	+111
14	262 39.5	67 47.2	23.6	271 14.6	19.7	85 51.3	35.3	20 38.3	13.7	270 06.0	146	2 00.1	+112
15	277 41.9	82 46.8	·· 24.8	286 16.3	·· 19.3	100 53.4	·· 35.2	35 40.4	·· 13.7	284 39.6	144	· 2 11.3	+111
16	292 44.4	97 46.5	25.9	301 17.9	18.8	115 55.5	35.0	50 42.6	13.8	299 13.0	145	2 22.4	+112
17	307 46.8	112 46.1	27.0	316 19.6	18.3	130 57.6	34.8	65 44.7	13.8	313 46.5	144	2 33.6	+111
18	322 49.3	127 45.8	− 4 28.2	331 21.3	− 5 17.8	145 59.7	+ 2 34.7	80 46.9	−19 13.9	328 19.9	144	+ 2 44.7	+112
19	337 51.8	142 45.4	29.3	346 22.9	17.3	161 01.7	34.5	95 49.1	14.0	342 53.3	143	2 55.9	+112
20	352 54.2	157 45.0	30.4	1 24.6	16.8	176 03.8	34.4	110 51.2	14.0	357 26.6	143	3 07.1	+111
21	7 56.7	172 44.7	·· 31.6	16 26.3	·· 16.4	191 05.9	·· 34.2	125 53.4	·· 14.1	11 59.9	142	· 3 18.2	+112
22	22 59.2	187 44.3	32.7	31 27.9	15.9	206 08.0	34.1	140 55.5	14.1	26 33.1	142	3 29.4	+111
23	38 01.6	202 44.0	33.8	46 29.6	15.4	221 10.1	33.9	155 57.7	14.2	41 06.3	142	3 40.5	+112
24	53 04.1	217 43.6	− 4 35.0	61 31.3	− 5 14.9	236 12.2	+ 2 33.8	170 59.9	−19 14.2	55 39.5	141	+ 3 51.7	+111
code	—	− 4	− 12	+ 17	+ 4	+ 21	− 2	+ 21	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
11 00	183 59.2	−17 21.5
01	198 59.2	22.2
02	213 59.1	22.9
03	228 59.0	23.6
04	243 59.0	24.3
05	258 58.9	25.0
06	273 58.8	−17 25.7
07	288 58.7	26.3
08	303 58.7	27.0
09	318 58.6	27.7
10	333 58.5	28.4
11	348 58.5	29.1
12	3 58.4	−17 29.8
13	18 58.3	30.5
14	33 58.2	31.2
15	48 58.2	31.8
16	63 58.1	32.5
17	78 58.0	33.2
18	93 57.9	−17 33.9
19	108 57.9	34.6
20	123 57.8	35.3
21	138 57.7	35.9
22	153 57.6	36.6
23	168 57.6	37.3
12 00	183 57.5	−17 38.0
01	198 57.4	38.7
02	213 57.3	39.3
03	228 57.3	40.0
04	243 57.2	40.7
05	258 57.1	41.4
06	273 57.0	−17 42.1
07	288 56.9	42.7
08	303 56.9	43.4
09	318 56.8	44.1
10	333 56.7	44.8
11	348 56.6	45.4
12	3 56.5	−17 46.1
13	18 56.5	46.8
14	33 56.4	47.5
15	48 56.3	48.1
16	63 56.2	48.8
17	78 56.1	49.5
18	93 56.0	−17 50.2
19	108 56.0	50.8
20	123 55.9	51.5
21	138 55.8	52.2
22	153 55.7	52.8
23	168 55.6	53.5
13 00	183 55.5	−17 54.2
01	198 55.5	54.8
02	213 55.4	55.5
03	228 55.3	56.2
04	243 55.2	56.8
05	258 55.1	57.5
06	273 55.0	−17 58.2
07	288 54.9	58.8
08	303 54.8	17 59.5
09	318 54.8	−18 00.2
10	333 54.7	00.8
11	348 54.6	01.5
12	3 54.5	−18 02.1
13	18 54.4	02.8
14	33 54.3	03.5
15	48 54.2	04.1
16	63 54.1	04.8
17	78 54.0	05.4
18	93 53.9	−18 06.1
19	108 53.9	06.8
20	123 53.8	07.4
21	138 53.7	08.1
22	153 53.6	08.7
23	168 53.5	09.4
24	183 53.4	−18 10.0
code	—	− 7

No.	Name	STARS SHA	STARS Dec.
		° ′	° ′
7	Acamar	315 50.1	−40 28.5
5	Achernar	335 57.8	−57 27.3
30	Acrux	173 57.3	−62 51.5
19	Adhara	255 45.7	−28 54.6
10	Aldebaran	291 37.8	+16 25.5
32	Alioth	166 58.4	+56 11.4
34	Alkaid	153 32.7	+49 31.6
55	Al Na'ir	28 36.9	−47 10.3
15	Alnilam	276 29.2	− 1 13.7
25	Alphard	218 37.8	− 8 28.2
41	Alphecca	126 47.3	+26 51.6
1	Alpheratz	358 27.2	+28 51.4
51	Altair	62 49.8	+ 8 45.4
2	Ankaa	353 57.2	−42 32.4
42	Antares	113 18.7	−26 20.2
37	Arcturus	146 34.8	+19 24.4
43	Atria	108 59.2	−68 57.1
22	Avior	234 35.2	−59 22.0
13	Bellatrix	279 17.3	+ 6 18.7
16	Betelg'se	271 47.0	+ 7 24.0
17	Canopus	264 14.6	−52 40.1
12	Capella	281 36.8	+45 57.3
53	Deneb	50 00.5	+45 07.9
28	Denebola	183 17.1	+14 48.7
4	Diphda	349 38.2	−18 13.3
27	Dubhe	194 43.9	+61 58.7
14	Elnath	279 06.0	+28 34.3
47	Eltanin	91 06.3	+51 29.9
54	Enif	34 28.8	+ 9 40.8
56	Fomalhaut	16 10.6	−29 51.0
31	Gacrux	172 48.7	−56 52.1
29	Gienah	176 36.2	−17 18.1
35	Hadar	149 48.8	−60 09.8
6	Hamal	328 48.4	+23 15.7
48	Kaus Aust.	84 40.4	−34 24.4
40	Kochab	137 19.3	+74 19.9
57	Markab	14 20.5	+14 58.6
8	Menkar	314 59.1	+ 3 55.4
36	Menkent	148 58.1	−36 09.4
24	Miapl'dus	221 48.7	−69 32.1
9	Mirfak	309 40.7	+49 42.6
50	Nunki	76 51.1	−26 21.1
52	Peacock	54 26.2	−56 52.6
21	Pollux	244 19.4	+28 07.7
20	Procyon	245 44.0	+ 5 20.2
46	R'alhague	96 46.1	+12 35.6
26	Regulus	208 28.7	+12 10.6
11	Rigel	281 52.6	− 8 15.0
38	Rigil Kent.	140 50.4	−60 39.4
44	Sabik	103 01.6	−15 40.3
3	Schedar	350 28.5	+56 18.4
45	Shaula	97 19.9	−37 04.4
18	Sirius	259 10.9	−16 39.3
33	Spica	159 16.3	−10 56.1
23	Suhail	223 23.6	−43 15.3
49	Vega	81 08.0	+38 44.9
39	Zub'g'bi	137 52.8	−15 51.7

GMT	Equation of Time (App. − Mean) 11	12	13
h	m s	m s	m s
0	+15 57.1	+15 50.1	+15 42.3
6	+15 55.4	+15 48.2	+15 40.3
12	+15 53.7	+15 46.3	+15 38.1
18	+15 51.9	+15 44.4	+15 36.0
24	+15 50.1	+15 42.3	+15 33.7

Lat. N °	Sunrise h m	Twlt. begins h m
72	10 22	5 26
70	9 31	5 25
68	8 59	5 25
66	8 36	5 23
64	8 18	5 23
62	8 03	5 21
60	7 51	5 20
58	7 40	5 19
56	7 30	5 18
54	7 22	5 17
52	7 15	5 16
50	7 08	5 14
45	6 54	5 11
40	6 42	5 07
35	6 31	5 04
30	6 23	5 00
20	6 07	4 51
10	5 54	4 40
0	5 41	4 29
10	5 28	4 14
20	5 14	3 55
30	4 58	3 29
35	4 48	3 12
40	4 37	2 50
45	4 25	2 22
50	4 09	1 37
52	4 02	1 09
54	3 53	0 19
56	3 44	////
58	3 34	////
60	3 22	////
S		

Lat. N °	Moonrise 11 h m	12 h m	13 h m	14 h m
72	14 02	13 49	13 36	13 23
70	13 53	13 46	13 39	13 32
68	13 45	13 43	13 41	13 39
66	13 38	13 41	13 43	13 45
64	13 33	13 39	13 44	13 50
62	13 28	13 37	13 45	13 55
60	13 24	13 35	13 46	13 59
58	13 20	13 34	13 48	14 02
56	13 17	13 33	13 48	14 05
54	13 14	13 32	13 49	14 08
52	13 11	13 30	13 50	14 10
50	13 08	13 30	13 51	14 13
45	13 03	13 28	13 52	14 18
40	12 58	13 26	13 53	14 22
35	12 54	13 24	13 54	14 26
30	12 51	13 23	13 55	14 29
20	12 45	13 21	13 57	14 35
10	12 40	13 19	13 59	14 40
0	12 35	13 17	14 00	14 45
10	12 29	13 15	14 02	14 49
20	12 24	13 13	14 03	14 55
30	12 18	13 11	14 05	15 01
35	12 14	13 10	14 06	15 04
40	12 10	13 08	14 07	15 08
45	12 06	13 06	14 09	15 12
50	12 00	13 04	14 10	15 18
52	11 57	13 03	14 11	15 21
54	11 55	13 03	14 12	15 23
56	11 51	13 01	14 13	15 27
58	11 48	13 00	14 14	15 30
60	11 44	12 59	14 15	15 34

Lat. N °	Sunset h m	Twlt. ends h m
72	13 05	17 58
70	13 57	17 59
68	14 28	18 00
66	14 52	18 02
64	15 10	18 03
62	15 25	18 04
60	15 37	18 05
58	15 48	18 07
56	15 57	18 08
54	16 06	18 10
52	16 13	18 10
50	16 20	18 12
45	16 34	18 15
40	16 46	18 19
35	16 57	18 24
30	17 05	18 27
20	17 21	18 37
10	17 35	18 48
0	17 48	19 00
10	18 01	19 15
20	18 15	19 35
30	18 31	20 01
35	18 41	20 18
40	18 52	20 40
45	19 05	21 10
50	19 20	21 55
52	19 28	22 25
54	19 36	23 25
56	19 46	////
58	19 56	////
60	20 09	////
S		

Lat. N °	Moonset 11 h m	12 h m	13 h m	14 h m
72	23 50	25 33	1 33	3 18
70	23 58	25 33	1 33	3 11
68	24 04	0 04	1 34	3 06
66	24 09	0 09	1 34	3 02
64	24 13	0 13	1 34	2 58
62	24 16	0 16	1 35	2 55
60	24 20	0 20	1 35	2 52
58	24 22	0 22	1 35	2 50
56	24 25	0 25	1 35	2 48
54	24 27	0 27	1 35	2 46
52	24 29	0 29	1 36	2 44
50	24 31	0 31	1 36	2 43
45	24 35	0 35	1 36	2 39
40	24 38	0 38	1 36	2 36
35	24 41	0 41	1 37	2 34
30	24 43	0 43	1 37	2 31
20	24 48	0 48	1 37	2 28
10	0 06	0 51	1 37	2 24
0	0 12	0 55	1 37	2 21
10	0 19	0 58	1 38	2 18
20	0 26	1 02	1 38	2 15
30	0 34	1 06	1 38	2 11
35	0 38	1 09	1 38	2 09
40	0 43	1 11	1 38	2 06
45	0 49	1 14	1 39	2 04
50	0 56	1 18	1 39	2 00
52	1 00	1 20	1 39	1 59
54	1 03	1 21	1 39	1 57
56	1 07	1 23	1 39	1 55
58	1 11	1 26	1 39	1 53
60	1 16	1 28	1 39	1 51

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
11	18 45	9 28	20 00	8 24	12 45
12	19 27	9 28	19 57	8 21	12 41
13	20 11	9 29	19 54	8 17	12 38
14	20 56	9 29	19 52	8 14	12 34

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.5	0.1	0.2
30	0.5	0.1	0.2
45	0.5	0.1	0.1
60	0.5	0.0	0.1
75	0.5	0.0	0.0
90			

Moon's Lower Limb Add

Alt. °	11 ′	12 ′	13 ′
0	12.4	12.8	13.5
4	12.4	12.8	13.5
8	12.4	12.8	13.5
12	12.4	12.8	13.6
16	12.5	12.9	13.6
20	12.6	12.9	13.6
24	12.6	13.0	13.7
28	12.7	13.0	13.7
32	12.8	13.1	13.8
36	12.9	13.2	13.9
40	13.0	13.3	13.9
44	13.1	13.4	14.0
48	13.3	13.5	14.1
52	13.4	13.7	14.2
56	13.5	13.8	14.3
60	13.7	13.9	14.4
64	13.9	14.1	14.5
68	14.0	14.2	14.6
72	14.2	14.3	14.7
76	14.4	14.5	14.8
80	14.5	14.6	14.9
84	14.7	14.8	15.0
88	14.8	14.9	15.1
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt. °	11 ′	12 ′	13 ′
0	17.4	17.2	16.7
4	17.4	17.1	16.7
8	17.3	17.1	16.7
12	17.3	17.1	16.7
16	17.2	17.0	16.6
20	17.2	17.0	16.6
24	17.1	16.9	16.6
28	17.0	16.9	16.5
32	16.9	16.8	16.4
36	16.8	16.7	16.4
40	16.7	16.6	16.3
44	16.6	16.5	16.2
48	16.5	16.4	16.1
52	16.3	16.2	16.1
56	16.2	16.1	16.0
60	16.0	16.0	15.9
64	15.9	15.8	15.8
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.3	15.3
84	15.0	15.1	15.2
88	14.9	15.0	15.1
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS — 3.5 GHA	Dec.	MARS — 0.8 GHA	Dec.	JUPITER — 1.4 GHA	Dec.	SATURN 0.7 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
14 00	53 04.1	217 43.6	− 4 35.0	61 31.3	− 5 14.9	236 12.2	+ 2 33.8	170 59.9	−19 14.2	55 39.5	141	+ 3 51.7	+111
01	68 06.6	232 43.2	36.1	76 32.9	14.4	251 14.3	33.6	186 02.0	14.3	70 12.6	141	4 02.8	+111
02	83 09.0	247 42.9	37.2	91 34.6	13.9	266 16.4	33.5	201 04.2	14.4	84 45.7	140	4 13.9	+112
03	98 11.5	262 42.5	.. 38.4	106 36.3	.. 13.4	281 18.5	.. 33.3	216 06.4	.. 14.4	99 18.7	140	· 4 25.1	+111
04	113 13.9	277 42.1	39.5	121 37.9	12.9	296 20.5	33.1	231 08.5	14.5	113 51.7	139	4 36.2	+111
05	128 16.4	292 41.8	40.6	136 39.6	12.5	311 22.6	33.0	246 10.7	14.5	128 24.6	139	4 47.3	+111
06	143 18.9	307 41.4	− 4 41.8	151 41.2	− 5 12.0	326 24.7	+ 2 32.8	261 12.8	−19 14.6	142 57.5	139	+ 4 58.4	+111
07	158 21.3	322 41.1	42.9	166 42.9	11.5	341 26.8	32.7	276 15.0	14.6	157 30.4	137	5 09.5	+111
08	173 23.8	337 40.7	44.0	181 44.6	11.0	356 28.9	32.5	291 17.2	14.7	172 03.1	138	5 20.6	+111
09	188 26.3	352 40.3	.. 45.2	196 46.2	.. 10.5	11 31.0	.. 32.4	306 19.3	.. 14.8	186 35.9	137	· 5 31.7	+110
10	203 28.7	7 40.0	46.3	211 47.9	10.0	26 33.1	32.2	321 21.5	14.8	201 08.6	136	5 42.7	+111
11	218 31.2	22 39.6	47.4	226 49.5	09.5	41 35.2	32.1	336 23.6	14.9	215 41.2	136	5 53.8	+110
12	233 33.7	37 39.2	− 4 48.6	241 51.2	− 5 09.0	56 37.3	+ 2 31.9	351 25.8	−19 14.9	230 13.8	135	+ 6 04.8	+110
13	248 36.1	52 38.9	49.7	256 52.9	08.6	71 39.3	31.8	6 28.0	15.0	244 46.3	135	6 15.8	+110
14	263 38.6	67 38.5	50.8	271 54.5	08.1	86 41.4	31.6	21 30.1	15.1	259 18.8	134	6 26.8	+110
15	278 41.1	82 38.1	.. 52.0	286 56.2	.. 07.6	101 43.5	.. 31.5	36 32.3	.. 15.1	273 51.2	133	· 6 37.8	+110
16	293 43.5	97 37.8	53.1	301 57.8	07.1	116 45.6	31.3	51 34.4	15.2	288 23.5	133	6 48.8	+109
17	308 46.0	112 37.4	54.2	316 59.5	06.6	131 47.7	31.2	66 36.6	15.2	302 55.8	133	6 59.7	+109
18	323 48.4	127 37.0	− 4 55.4	332 01.1	− 5 06.1	146 49.8	+ 2 31.0	81 38.8	−19 15.3	317 28.1	132	+ 7 10.6	+109
19	338 50.9	142 36.7	56.5	347 02.8	05.6	161 51.9	30.8	96 40.9	15.3	332 00.3	131	7 21.5	+109
20	353 53.4	157 36.3	57.6	2 04.4	05.1	176 54.0	30.7	111 43.1	15.4	346 32.4	131	7 32.4	+109
21	8 55.8	172 35.9	.. 58.8	17 06.1	.. 04.6	191 56.1	.. 30.5	126 45.2	.. 15.5	1 04.5	130	· 7 43.3	+108
22	23 58.3	187 35.6	4 59.9	32 07.7	04.1	206 58.2	30.4	141 47.4	15.5	15 36.5	129	7 54.1	+108
23	39 00.8	202 35.2	5 01.0	47 09.4	03.7	222 00.3	30.2	156 49.6	15.6	30 08.4	129	8 04.9	+108
15 00	54 03.2	217 34.8	− 5 02.2	62 11.0	− 5 03.2	237 02.4	+ 2 30.1	171 51.7	−19 15.6	44 40.3	128	+ 8 15.7	+108
01	69 05.7	232 34.5	03.3	77 12.7	02.7	252 04.4	29.9	186 53.9	15.7	59 12.1	127	8 26.5	+107
02	84 08.2	247 34.1	04.4	92 14.3	02.2	267 06.5	29.8	201 56.0	15.7	73 43.8	127	8 37.2	+107
03	99 10.6	262 33.7	.. 05.6	107 16.0	.. 01.7	282 08.6	.. 29.6	216 58.2	.. 15.8	88 15.5	126	· 8 47.9	+107
04	114 13.1	277 33.4	06.7	122 17.6	01.2	297 10.7	29.5	232 00.4	15.9	102 47.1	126	8 58.6	+107
05	129 15.6	292 33.0	07.8	137 19.2	00.7	312 12.8	29.3	247 02.5	15.9	117 18.7	125	9 09.3	+106
06	144 18.0	307 32.6	− 5 09.0	152 20.9	− 5 00.2	327 14.9	+ 2 29.2	262 04.7	−19 16.0	131 50.2	124	+ 9 19.9	+106
07	159 20.5	322 32.3	10.1	167 22.5	4 59.7	342 17.0	29.0	277 06.8	16.0	146 21.6	123	9 30.5	+105
08	174 22.9	337 31.9	11.2	182 24.2	59.2	357 19.1	28.9	292 09.0	16.1	160 52.9	123	9 41.0	+106
09	189 25.4	352 31.5	.. 12.3	197 25.8	.. 58.7	12 21.2	.. 28.7	307 11.2	.. 16.1	175 24.2	122	· 9 51.6	+104
10	204 27.9	7 31.2	13.5	212 27.5	58.2	27 23.3	28.6	322 13.3	16.2	189 55.4	122	10 02.0	+105
11	219 30.3	22 30.8	14.6	227 29.1	57.7	42 25.4	28.4	337 15.5	16.3	204 26.6	120	10 12.5	+104
12	234 32.8	37 30.4	− 5 15.7	242 30.7	− 4 57.3	57 27.5	+ 2 28.3	352 17.6	−19 16.3	218 57.6	120	+10 22.9	+104
13	249 35.3	52 30.0	16.9	257 32.4	56.8	72 29.6	28.1	7 19.8	16.4	233 28.6	119	10 33.3	+103
14	264 37.7	67 29.7	18.0	272 34.0	56.3	87 31.7	28.0	22 22.0	16.4	247 59.5	119	10 43.6	+103
15	279 40.2	82 29.3	.. 19.1	287 35.7	.. 55.8	102 33.8	.. 27.8	37 24.1	.. 16.5	262 30.4	118	·10 53.9	+102
16	294 42.7	97 28.9	20.3	302 37.3	55.3	117 35.8	27.7	52 26.3	16.5	277 01.2	117	11 04.1	+102
17	309 45.1	112 28.6	21.4	317 38.9	54.8	132 37.9	27.5	67 28.4	16.6	291 31.9	116	11 14.3	+102
18	324 47.6	127 28.2	− 5 22.5	332 40.6	− 4 54.3	147 40.0	+ 2 27.4	82 30.6	−19 16.7	306 02.5	115	+11 24.5	+101
19	339 50.0	142 27.8	23.6	347 42.2	53.8	162 42.1	27.2	97 32.8	16.7	320 33.0	115	11 34.6	+101
20	354 52.5	157 27.4	24.8	2 43.8	53.3	177 44.2	27.0	112 34.9	16.8	335 03.5	114	11 44.7	+100
21	9 55.0	172 27.1	.. 25.9	17 45.5	.. 52.8	192 46.3	.. 26.9	127 37.1	.. 16.8	349 33.9	113	·11 54.7	+100
22	24 57.4	187 26.7	27.0	32 47.1	52.3	207 48.4	26.7	142 39.2	16.9	4 04.2	113	12 04.7	+ 99
23	39 59.9	202 26.3	28.2	47 48.7	51.8	222 50.5	26.6	157 41.4	16.9	18 34.5	111	12 14.6	+ 98
16 00	55 02.4	217 25.9	− 5 29.3	62 50.4	− 4 51.3	237 52.6	+ 2 26.4	172 43.6	−19 17.0	33 04.6	111	+12 24.4	+ 99
01	70 04.8	232 25.6	30.4	77 52.0	50.8	252 54.7	26.3	187 45.7	17.1	47 34.7	110	12 34.3	+ 97
02	85 07.3	247 25.2	31.6	92 53.6	50.3	267 56.8	26.1	202 47.9	17.1	62 04.7	110	12 44.0	+ 97
03	100 09.8	262 24.8	.. 32.7	107 55.3	.. 49.8	282 58.9	.. 26.0	217 50.0	.. 17.2	76 34.7	108	·12 53.7	+ 97
04	115 12.2	277 24.4	33.8	122 56.9	49.3	298 01.0	25.8	232 52.2	17.2	91 04.5	108	13 03.4	+ 96
05	130 14.7	292 24.1	34.9	137 58.5	48.8	313 03.1	25.7	247 54.3	17.3	105 34.3	106	13 13.0	+ 95
06	145 17.2	307 23.7	− 5 36.1	153 00.1	− 4 48.3	328 05.2	+ 2 25.5	262 56.5	−19 17.3	120 03.9	107	+13 22.5	+ 95
07	160 19.6	322 23.3	37.2	168 01.8	47.8	343 07.3	25.4	277 58.7	17.4	134 33.6	105	13 32.0	+ 94
08	175 22.1	337 22.9	38.3	183 03.4	47.3	358 09.4	25.2	293 00.8	17.5	149 03.1	104	13 41.4	+ 94
09	190 24.5	352 22.6	.. 39.5	198 05.0	.. 46.8	13 11.5	.. 25.1	308 03.0	.. 17.5	163 32.5	104	·13 50.8	+ 93
10	205 27.0	7 22.2	40.6	213 06.6	46.3	28 13.6	24.9	323 05.1	17.6	178 01.9	102	14 00.1	+ 92
11	220 29.5	22 21.8	41.7	228 08.3	45.8	43 15.7	24.8	338 07.3	17.6	192 31.1	102	14 09.3	+ 92
12	235 31.9	37 21.4	− 5 42.8	243 09.9	− 4 45.3	58 17.8	+ 2 24.6	353 09.5	−19 17.7	207 00.3	102	+14 18.5	+ 91
13	250 34.4	52 21.1	44.0	258 11.5	44.8	73 19.9	24.5	8 11.6	17.7	221 29.5	100	14 27.6	+ 90
14	265 36.9	67 20.7	45.1	273 13.1	44.3	88 22.0	24.3	23 13.8	17.8	235 58.5	99	14 36.6	+ 89
15	280 39.3	82 20.3	.. 46.2	288 14.8	.. 43.8	103 24.1	.. 24.2	38 15.9	.. 17.9	250 27.4	99	·14 45.5	+ 89
16	295 41.8	97 19.9	47.3	303 16.4	43.3	118 26.2	24.0	53 18.1	17.9	264 56.3	98	14 54.4	+ 88
17	310 44.3	112 19.5	48.5	318 18.0	42.8	133 28.3	23.9	68 20.3	18.0	279 25.1	96	15 03.2	+ 88
18	325 46.7	127 19.2	− 5 49.6	333 19.6	− 4 42.3	148 30.4	+ 2 23.7	83 22.4	−19 18.0	293 53.7	97	+15 12.0	+ 87
19	340 49.2	142 18.8	50.7	348 21.2	41.8	163 32.5	23.6	98 24.6	18.1	308 22.4	95	15 20.7	+ 85
20	355 51.7	157 18.4	51.9	3 22.8	41.3	178 34.6	23.4	113 26.7	18.1	322 50.9	94	15 29.2	+ 86
21	10 54.1	172 18.0	.. 53.0	18 24.5	.. 40.8	193 36.7	.. 23.3	128 28.9	.. 18.2	337 19.3	94	·15 37.8	+ 84
22	25 56.6	187 17.6	54.1	33 26.1	40.3	208 38.8	23.2	143 31.1	18.3	351 47.7	92	15 46.2	+ 84
23	40 59.0	202 17.3	55.2	48 27.7	39.8	223 40.9	23.0	158 33.2	18.3	6 15.9	92	15 54.6	+ 82
24	56 01.5	217 16.9	− 5 56.4	63 29.3	− 4 39.3	238 43.0	+ 2 22.9	173 35.4	−19 18.4	20 44.1	91	+16 02.8	+ 82
code	—	− 4	− 12	+ 17	+ 5	+ 21	− 2	+ 22	− 1				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
14 00	183 53.4	−18 10.0	7	Acamar	315 50.1	−40 28.6
01	198 53.3	10.7	5	Achernar	335 57.8	−57 27.4
02	213 53.2	11.4	30	Acrux	173 57.3	−62 51.4
03	228 53.1	12.0	19	Adhara	255 45.6	−28 54.6
04	243 53.0	12.7	10	Aldebaran	291 37.8	+16 25.5
05	258 52.9	13.3				
06	273 52.8	−18 14.0	32	Alioth	166 58.3	+56 11.4
07	288 52.7	14.6	34	Alkaid	153 32.7	+49 31.6
08	303 52.6	15.3	55	Al Na'ir	28 36.9	−47 10.3
09	318 52.5	15.9	15	Alnilam	276 29.1	− 1 13.7
10	333 52.4	16.6	25	Alphard	218 37.8	− 8 28.2
11	348 52.3	17.2				
12	3 52.2	−18 17.9	41	Alphecca	126 47.3	+26 51.6
13	18 52.1	18.5	1	Alpheratz	358 27.2	+28 51.4
14	33 52.0	19.2	51	Altair	62 49.8	+ 8 45.4
15	48 51.9	19.8	2	Ankaa	353 57.2	−42 32.4
16	63 51.8	20.4	42	Antares	113 18.7	−26 20.2
17	78 51.7	21.1				
18	93 51.6	−18 21.7	37	Arcturus	146 34.8	+19 24.4
19	108 51.5	22.4	43	Atria	108 59.2	−68 57.1
20	123 51.4	23.0	22	Avior	234 35.2	−59 22.0
21	138 51.3	23.7	13	Bellatrix	279 17.2	+ 6 18.7
22	153 51.2	24.3	16	Betelg'se	271 47.0	+ 7 24.0
23	168 51.1	25.0				
			17	Canopus	264 14.6	−52 40.1
15 00	183 51.0	−18 25.6	12	Capella	281 36.8	+45 57.3
01	198 50.9	26.2	53	Deneb	50 00.5	+45 07.9
02	213 50.8	26.9	28	Denebola	183 17.1	+14 48.7
03	228 50.7	27.5	4	Diphda	349 38.2	−18 13.3
04	243 50.6	28.2				
05	258 50.5	28.8	27	Dubhe	194 43.9	+61 58.7
06	273 50.4	−18 29.4	14	Elnath	279 06.0	+28 34.3
07	288 50.3	30.1	47	Eltanin	91 06.3	+51 29.9
08	303 50.2	30.7	54	Enif	34 28.8	+ 9 40.8
09	318 50.1	31.3	56	Fomalhaut	16 10.6	−29 51.1
10	333 50.0	32.0				
11	348 49.9	32.6	31	Gacrux	172 48.7	−56 52.1
12	3 49.8	−18 33.3	29	Gienah	176 36.2	−17 18.1
13	18 49.7	33.9	35	Hadar	149 48.8	−60 09.8
14	33 49.5	34.5	6	Hamal	328 48.4	+23 15.7
15	48 49.4	35.2	48	Kaus Aust.	84 40.4	−34 24.4
16	63 49.3	35.8				
17	78 49.2	36.4	40	Kochab	137 19.3	+74 19.9
18	93 49.1	−18 37.0	57	Markab	14 20.5	+14 58.6
19	108 49.0	37.7	8	Menkar	314 59.1	+ 3 55.4
20	123 48.9	38.3	36	Menkent	148 58.0	−36 09.4
21	138 48.8	38.9	24	Miapl'dus	221 48.6	−69 32.1
22	153 48.7	39.6				
23	168 48.6	40.2	9	Mirfak	309 40.7	+49 42.6
			50	Nunki	76 51.1	−26 21.1
16 00	183 48.4	−18 40.8	52	Peacock	54 26.2	−56 52.6
01	198 48.3	41.5	21	Pollux	244 19.4	+28 07.7
02	213 48.2	42.1	20	Procyon	245 44.0	+ 5 20.2
03	228 48.1	42.7				
04	243 48.0	43.3	46	R'alhague	96 46.2	+12 35.6
05	258 47.9	44.0	26	Regulus	208 28.7	+12 10.6
06	273 47.8	−18 44.6	11	Rigel	281 52.5	− 8 15.0
07	288 47.7	45.2	38	Rigil Kent.	140 50.4	−60 39.4
08	303 47.5	45.8	44	Sabik	103 01.6	−15 40.3
09	318 47.4	46.4				
10	333 47.3	47.1	3	Schedar	350 28.5	+56 18.4
11	348 47.2	47.7	45	Shaula	97 19.9	−37 04.4
12	3 47.1	−18 48.3	18	Sirius	259 10.9	−16 39.3
13	18 47.0	48.9	33	Spica	159 16.3	−10 56.1
14	33 46.9	49.6	23	Suhail	223 23.6	−43 15.3
15	48 46.7	50.2				
16	63 46.6	50.8	49	Vega	81 08.0	+38 44.8
17	78 46.5	51.4	39	Zub'g'bi	137 52.8	−15 51.7
18	93 46.4	−18 52.0				
19	108 46.3	52.6				
20	123 46.1	53.3				
21	138 46.0	53.9				
22	153 45.9	54.5				
23	168 45.8	55.1				
24	183 45.7	−18 55.7				
code	—	− 6				

Lat. N °	Sunrise h m	Twlt. begins h m	Moonrise 14 h m	15 h m	16 h m	17 h m
72	11 04	5 36	13 23	13 08	12 47	12 01
70	9 50	5 34	13 32	13 24	13 16	13 03
68	9 13	5 32	13 39	13 38	13 37	13 39
66	8 47	5 32	13 45	13 49	13 54	14 05
64	8 28	5 29	13 50	13 58	14 08	14 25
62	8 12	5 28	13 55	14 06	14 20	14 41
60	7 58	5 27	13 59	14 13	14 30	14 54
58	7 47	5 24	14 02	14 19	14 39	15 06
56	7 37	5 24	14 05	14 24	14 47	15 16
54	7 28	5 22	14 08	14 29	14 54	15 26
52	7 20	5 20	14 10	14 33	15 00	15 34
50	7 13	5 18	14 13	14 37	15 06	15 41
45	6 58	5 14	14 18	14 46	15 18	15 57
40	6 45	5 10	14 22	14 53	15 29	16 09
35	6 34	5 06	14 26	15 00	15 37	16 20
30	6 25	5 02	14 29	15 05	15 45	16 30
20	6 09	4 52	14 35	15 15	15 59	16 47
10	5 55	4 41	14 40	15 23	16 10	17 01
0	5 41	4 28	14 45	15 31	16 22	17 15
10	5 27	4 13	14 49	15 40	16 33	17 29
20	5 13	3 53	14 55	15 48	16 45	17 44
30	4 56	3 26	15 01	15 58	16 59	18 01
35	4 46	3 09	15 04	16 04	17 07	18 11
40	4 35	2 45	15 08	16 11	17 16	18 22
45	4 21	2 15	15 12	16 19	17 27	18 36
50	4 05	1 27	15 18	16 28	17 40	18 52
52	3 57	0 53	15 21	16 32	17 46	19 00
54	3 48	////	15 23	16 37	17 53	19 09
56	3 38	////	15 27	16 43	18 01	19 19
58	3 27	////	15 30	16 49	18 09	19 30
60	3 14	////	15 34	16 55	18 19	19 43

Lat. N °	Sunset h m	Twlt. ends h m	Moonset 14 h m	15 h m	16 h m	17 h m
72	12 23	17 48	3 18	5 09	7 11	9 47
70	13 38	17 50	3 11	4 54	6 44	8 46
68	14 15	17 53	3 06	4 42	6 24	8 11
66	14 41	17 55	3 02	4 33	6 08	7 46
64	15 01	17 57	2 58	4 25	5 55	7 27
62	15 17	17 58	2 55	4 18	5 44	7 11
60	15 30	18 00	2 52	4 12	5 34	6 58
58	15 42	18 02	2 50	4 07	5 26	6 47
56	15 52	18 04	2 48	4 02	5 19	6 37
54	16 01	18 06	2 46	3 58	5 13	6 29
52	16 09	18 07	2 44	3 54	5 07	6 21
50	16 16	18 09	2 43	3 51	5 02	6 14
45	16 31	18 13	2 39	3 44	4 51	5 59
40	16 44	18 18	2 36	3 38	4 42	5 47
35	16 55	18 22	2 34	3 33	4 34	5 37
30	17 04	18 27	2 31	3 28	4 27	5 28
20	17 20	18 36	2 28	3 20	4 15	5 13
10	17 35	18 48	2 24	3 13	4 05	4 59
0	17 48	19 01	2 21	3 07	3 55	4 47
10	18 02	19 17	2 18	3 00	3 45	4 34
20	18 17	19 37	2 15	2 53	3 35	4 21
30	18 34	20 04	2 11	2 46	3 23	4 05
35	18 44	20 22	2 09	2 41	3 17	3 57
40	18 55	20 45	2 06	2 36	3 09	3 47
45	19 09	21 17	2 04	2 30	3 00	3 35
50	19 26	22 07	2 00	2 23	2 49	3 21
52	19 34	22 43	1 59	2 20	2 44	3 14
54	19 42	////	1 57	2 16	2 39	3 07
56	19 52	////	1 55	2 12	2 33	2 58
58	20 04	////	1 53	2 08	2 26	2 49
60	20 17	////	1 51	2 03	2 19	2 39

GMT	Equation of Time (App.—Mean) 14 m s	15 m s	16 m s
h			
0	+15 33.7	+15 24.3	+15 14.0
6	+15 31.4	+15 21.8	+15 11.3
12	+15 29.1	+15 19.3	+15 08.6
18	+15 26.7	+15 16.7	+15 05.8
24	+15 24.3	+15 14.0	+15 02.9

GMT of Transit
Meridian of Greenwich ,

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
14	20 56	9 29	19 52	8 14	12 34
15	21 43	9 30	19 49	8 11	12 31
16	22 34	9 31	19 47	8 07	12 27
17	23 28	9 31	19 44	8 04	12 24

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb **Add**	Venus **Add**	Mars **Add**
°	′	′	′
0	0.5	0.1	0.2
30	0.5	0.1	0.2
45	0.5	0.1	0.1
60	0.5	0.0	0.1
75	0.5	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	14	15	16
°	′	′	′
0	14.3	15.3	16.2
4	14.3	15.3	16.2
8	14.3	15.3	16.2
12	14.3	15.3	16.2
16	14.3	15.3	16.2
20	14.4	15.3	16.2
24	14.4	15.3	16.1
28	14.4	15.3	16.1
32	14.4	15.3	16.1
36	14.5	15.3	16.1
40	14.5	15.3	16.1
44	14.6	15.4	16.0
48	14.6	15.4	16.0
52	14.7	15.4	16.0
56	14.7	15.4	16.0
60	14.8	15.4	15.9
64	14.9	15.4	15.9
68	14.9	15.4	15.9
72	15.0	15.4	15.8
76	15.1	15.5	15.8
80	15.1	15.5	15.8
84	15.2	15.5	15.7
88	15.3	15.5	15.7
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	14	15	16
°	′	′	′
0	16.3	15.7	15.2
4	16.3	15.7	15.2
8	16.3	15.7	15.2
12	16.2	15.7	15.2
16	16.2	15.7	15.2
20	16.2	15.7	15.2
24	16.2	15.7	15.2
28	16.1	15.7	15.3
32	16.1	15.7	15.3
36	16.1	15.7	15.3
40	16.0	15.6	15.3
44	16.0	15.6	15.3
48	15.9	15.6	15.4
52	15.9	15.6	15.4
56	15.8	15.6	15.4
60	15.7	15.6	15.5
64	15.7	15.6	15.5
68	15.6	15.6	15.5
72	15.6	15.6	15.5
76	15.5	15.5	15.6
80	15.4	15.5	15.6
84	15.3	15.5	15.7
88	15.3	15.5	15.7
90			

Subtract from table, back cover

G M T	♈ GHA	VENUS −3.5 GHA	Dec	MARS −0.8 GHA	Dec	JUPITER −1.4 GHA	Dec	SATURN 0.7 GHA	Dec	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
17 00	56 01.5	217 16.9	− 5 56.4	63 29.3	− 4 39.3	238 43.0	+ 2 22.9	173 35.4	−19 18.4	20 44.1	91	+16 02.8	+ 82
01	71 04.0	232 16.5	57.5	78 30.9	38.8	253 45.1	22.7	188 37.5	18.4	35 12.2	90	16 11.0	+ 81
02	86 06.4	247 16.1	58.6	93 32.5	38.3	268 47.2	22.6	203 39.7	18.5	49 40.2	90	16 19.1	+ 81
03	101 08.9	262 15.7	· 5 59.7	108 34.2	·· 37.8	283 49.3	·· 22.4	218 41.8	·· 18.5	64 08.2	88	·16 27.2	+ 79
04	116 11.4	277 15.4	6 00.9	123 35.8	37.3	298 51.4	22.3	233 44.0	18.6	78 36.0	88	16 35.1	+ 79
05	131 13.8	292 15.0	02.0	138 37.4	36.8	313 53.5	22.1	248 46.2	18.7	93 03.8	87	16 43.0	+ 77
06	146 16.3	307 14.6	− 6 03.1	153 39.0	− 4 36.3	328 55.6	+ 2 22.0	263 48.3	−19 18.7	107 31.5	86	+16 50.7	+ 77
07	161 18.8	322 14.2	04.2	168 40.6	35.8	343 57.7	21.8	278 50.5	18.8	121 59.1	85	16 58.4	+ 76
08	176 21.2	337 13.8	05.4	183 42.2	35.3	358 59.8	21.7	293 52.6	18.8	136 26.6	84	17 06.0	+ 75
09	191 23.7	352 13.4	·· 06.5	198 43.8	·· 34.8	14 01.9	·· 21.5	308 54.8	·· 18.9	150 54.0	83	·17 13.5	+ 74
10	206 26.2	7 13.1	07.6	213 45.4	34.3	29 04.0	21.4	323 57.0	18.9	165 21.3	83	17 20.9	+ 73
11	221 28.6	22 12.7	08.7	228 47.0	33.8	44 06.1	21.2	338 59.1	19.0	179 48.6	82	17 28.2	+ 72
12	236 31.1	37 12.3	− 6 09.9	243 48.6	− 4 33.3	59 08.2	+ 2 21.1	354 01.3	−19 19.1	194 15.8	81	+17 35.4	+ 71
13	251 33.5	52 11.9	11.0	258 50.2	32.8	74 10.3	20.9	9 03.4	19.1	208 42.9	80	17 42.5	+ 70
14	266 36.0	67 11.5	12.1	273 51.9	32.3	89 12.4	20.8	24 05.6	19.2	223 09.9	79	17 49.5	+ 69
15	281 38.5	82 11.1	·· 13.2	288 53.5	·· 31.8	104 14.5	·· 20.6	39 07.7	·· 19.2	237 36.8	79	·17 56.4	+ 68
16	296 40.9	97 10.8	14.4	303 55.1	31.3	119 16.6	20.5	54 09.9	19.3	252 03.7	78	18 03.2	+ 67
17	311 43.4	112 10.4	15.5	318 56.7	30.8	134 18.7	20.3	69 12.1	19.3	266 30.5	77	18 09.9	+ 66
18	326 45.9	127 10.0	− 6 16.6	333 58.3	− 4 30.3	149 20.8	+ 2 20.2	84 14.2	−19 19.4	280 57.2	76	+18 16.5	+ 65
19	341 48.3	142 09.6	17.7	348 59.9	29.8	164 22.9	20.0	99 16.4	19.5	295 23.8	75	18 23.0	+ 64
20	356 50.8	157 09.2	18.9	4 01.5	29.3	179 25.0	19.9	114 18.5	19.5	309 50.3	75	18 29.4	+ 63
21	11 53.3	172 08.8	·· 20.0	19 03.1	·· 28.8	194 27.1	·· 19.7	129 20.7	·· 19.6	324 16.8	74	·18 35.7	+ 62
22	26 55.7	187 08.4	21.1	34 04.7	28.2	209 29.2	19.6	144 22.9	19.6	338 43.2	73	18 41.9	+ 60
23	41 58.2	202 08.0	22.2	49 06.3	27.7	224 31.3	19.5	159 25.0	19.7	353 09.5	72	18 47.9	+ 60
18 00	57 00.6	217 07.7	− 6 23.4	64 07.9	− 4 27.2	239 33.4	+ 2 19.3	174 27.2	−19 19.7	7 35.7	72	+18 53.9	+ 58
01	72 03.1	232 07.3	24.5	79 09.5	26.7	254 35.5	19.2	189 29.3	19.8	22 01.9	70	18 59.7	+ 57
02	87 05.6	247 06.9	25.6	94 11.1	26.2	269 37.6	19.0	204 31.5	19.9	36 27.9	70	19 05.4	+ 57
03	102 08.0	262 06.5	·· 26.7	109 12.7	·· 25.7	284 39.7	·· 18.9	219 33.6	·· 19.9	50 53.9	70	·19 11.1	+ 55
04	117 10.5	277 06.1	27.8	124 14.3	25.2	299 41.8	18.7	234 35.8	20.0	65 19.9	68	19 16.6	+ 53
05	132 13.0	292 05.7	29.0	139 15.9	24.7	314 43.9	18.6	249 38.0	20.0	79 45.7	68	19 21.9	+ 53
06	147 15.4	307 05.3	− 6 30.1	154 17.5	− 4 24.2	329 46.0	+ 2 18.4	264 40.1	−19 20.1	94 11.5	68	+19 27.2	+ 52
07	162 17.9	322 04.9	31.2	169 19.1	23.7	344 48.1	18.3	279 42.3	20.1	108 37.3	66	19 32.4	+ 50
08	177 20.4	337 04.6	32.3	184 20.7	23.2	359 50.3	18.1	294 44.4	20.2	123 02.9	66	19 37.4	+ 49
09	192 22.8	352 04.2	·· 33.5	199 22.2	·· 22.7	14 52.4	·· 18.0	309 46.6	·· 20.3	137 28.5	65	·19 42.3	+ 48
10	207 25.3	7 03.8	34.6	214 23.8	22.2	29 54.5	17.8	324 48.7	20.3	151 54.0	65	19 47.1	+ 46
11	222 27.8	22 03.4	35.7	229 25.4	21.7	44 56.6	17.7	339 50.9	20.4	166 19.5	63	19 51.7	+ 46
12	237 30.2	37 03.0	− 6 36.8	244 27.0	− 4 21.1	59 58.7	+ 2 17.5	354 53.1	−19 20.4	180 44.8	64	+19 56.3	+ 44
13	252 32.7	52 02.6	37.9	259 28.6	20.6	75 00.8	17.4	9 55.2	20.5	195 10.2	62	20 00.7	+ 43
14	267 35.1	67 02.2	39.1	274 30.2	20.1	90 02.9	17.3	24 57.4	20.5	209 35.4	62	20 05.0	+ 41
15	282 37.6	82 01.8	·· 40.2	289 31.8	·· 19.6	105 05.0	·· 17.1	39 59.5	·· 20.6	224 00.6	62	·20 09.1	+ 41
16	297 40.1	97 01.4	41.3	304 33.4	19.1	120 07.1	17.0	55 01.7	20.6	238 25.8	60	20 13.2	+ 39
17	312 42.5	112 01.0	42.4	319 35.0	18.6	135 09.2	16.8	70 03.9	20.7	252 50.8	60	20 17.1	+ 37
18	327 45.0	127 00.6	− 6 43.5	334 36.6	− 4 18.1	150 11.3	+ 2 16.7	85 06.0	−19 20.8	267 15.8	60	+20 20.8	+ 37
19	342 47.5	142 00.2	44.7	349 38.1	17.6	165 13.4	16.5	100 08.2	20.8	281 40.8	59	20 24.5	+ 35
20	357 49.9	156 59.9	45.8	4 39.7	17.1	180 15.5	16.4	115 10.3	20.9	296 05.7	59	20 28.0	+ 34
21	12 52.4	171 59.5	·· 46.9	19 41.3	·· 16.6	195 17.6	·· 16.2	130 12.5	·· 20.9	310 30.6	58	·20 31.4	+ 32
22	27 54.9	186 59.1	48.0	34 42.9	16.0	210 19.7	16.1	145 14.6	21.0	324 55.4	57	20 34.6	+ 31
23	42 57.3	201 58.7	49.1	49 44.5	15.5	225 21.9	15.9	160 16.8	21.0	339 20.1	57	20 37.7	+ 30
19 00	57 59.8	216 58.3	− 6 50.3	64 46.1	− 4 15.0	240 24.0	+ 2 15.8	175 19.0	−19 21.1	353 44.8	57	+20 40.7	+ 29
01	73 02.3	231 57.9	51.4	79 47.7	14.5	255 26.1	15.7	190 21.1	21.2	8 09.5	56	20 43.6	+ 27
02	88 04.7	246 57.5	52.5	94 49.2	14.0	270 28.2	15.5	205 23.3	21.2	22 34.1	55	20 46.3	+ 25
03	103 07.2	261 57.1	·· 53.6	109 50.8	·· 13.5	285 30.3	·· 15.4	220 25.4	·· 21.3	36 58.6	55	·20 48.8	+ 25
04	118 09.6	276 56.7	54.7	124 52.4	13.0	300 32.4	15.2	235 27.6	21.3	51 23.1	55	20 51.3	+ 23
05	133 12.1	291 56.3	55.9	139 54.0	12.5	315 34.5	15.1	250 29.7	21.4	65 47.6	54	20 53.6	+ 21
06	148 14.6	306 55.9	− 6 57.0	154 55.6	− 4 12.0	330 36.6	+ 2 14.9	265 31.9	−19 21.4	80 12.0	54	+20 55.7	+ 20
07	163 17.0	321 55.5	58.1	169 57.2	11.4	345 38.7	14.8	280 34.1	21.5	94 36.4	53	20 57.7	+ 19
08	178 19.5	336 55.1	6 59.2	184 58.7	10.9	0 40.8	14.6	295 36.2	21.6	109 00.7	53	20 59.6	+ 17
09	193 22.0	351 54.7	· 7 00.3	200 00.3	·· 10.4	15 42.9	·· 14.5	310 38.4	·· 21.6	123 25.0	53	·21 01.3	+ 16
10	208 24.4	6 54.3	01.4	215 01.9	09.9	30 45.1	14.4	325 40.5	21.7	137 49.3	53	21 02.9	+ 15
11	223 26.9	21 53.9	02.6	230 03.5	09.4	45 47.2	14.2	340 42.7	21.7	152 13.6	52	21 04.4	+ 13
12	238 29.4	36 53.5	− 7 03.7	245 05.0	− 4 08.9	60 49.3	+ 2 14.1	355 44.8	−19 21.8	166 37.8	52	+21 05.7	+ 12
13	253 31.8	51 53.1	04.8	260 06.6	08.4	75 51.4	13.9	10 47.0	21.8	181 02.0	51	21 06.9	+ 10
14	268 34.3	66 52.7	05.9	275 08.2	07.9	90 53.5	13.8	25 49.2	21.9	195 26.1	51	21 07.9	+ 9
15	283 36.8	81 52.3	·· 07.0	290 09.8	·· 07.3	105 55.6	·· 13.6	40 51.3	·· 21.9	209 50.2	51	·21 08.8	+ 7
16	298 39.2	96 51.9	08.1	305 11.3	06.8	120 57.7	13.5	55 53.5	22.0	224 14.3	51	21 09.5	+ 6
17	313 41.7	111 51.5	09.3	320 12.9	06.3	135 59.8	13.3	70 55.6	22.1	238 38.4	51	21 10.1	+ 5
18	328 44.1	126 51.1	− 7 10.4	335 14.5	− 4 05.8	151 01.9	+ 2 13.2	85 57.8	−19 22.1	253 02.5	50	+21 10.6	+ 3
19	343 46.6	141 50.7	11.5	350 16.1	05.3	166 04.0	13.1	100 59.9	22.2	267 26.5	50	21 10.9	+ 1
20	358 49.1	156 50.3	12.6	5 17.6	04.8	181 06.2	12.9	116 02.1	22.2	281 50.5	50	21 11.0	+ 1
21	13 51.5	171 49.9	·· 13.7	20 19.2	·· 04.3	196 08.3	·· 12.8	131 04.3	·· 22.3	296 14.5	50	·21 11.1	− 2
22	28 54.0	186 49.5	14.8	35 20.8	03.7	211 10.4	12.6	146 06.4	22.3	310 38.5	49	21 10.9	− 2
23	43 56.5	201 49.1	15.9	50 22.3	03.2	226 12.5	12.5	161 08.6	22.4	325 02.4	50	21 10.7	− 5
24	58 58.9	216 48.7	− 7 17.1	65 23.9	− 4 02.7	241 14.6	+ 2 12.3	176 10.7	−19 22.5	339 26.4	50	+21 10.2	− 5
code	−	− 4	− 11	+ 16	+ 5	+ 21	− 1	+ 21	− 1				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
17 0	183 45.7	−18 55.7
1	198 45.5	56.3
2	213 45.4	56.9
3	228 45.3	57.6
4	243 45.2	58.2
5	258 45.1	58.8
6	273 44.9	−18 59.4
7	288 44.8	19 00.0
8	303 44.7	00.6
9	318 44.6	01.2
10	333 44.4	01.8
11	348 44.3	02.4
12	3 44.2	−19 03.0
13	18 44.1	03.6
14	33 44.0	04.3
15	48 43.8	04.9
16	63 43.7	05.5
17	78 43.6	06.1
18	93 43.4	−19 06.7
19	108 43.3	07.3
20	123 43.2	07.9
21	138 43.1	08.5
22	153 42.9	09.1
23	168 42.8	09.7
18 0	183 42.7	−19 10.3
1	198 42.6	10.9
2	213 42.4	11.5
3	228 42.3	12.1
4	243 42.2	12.7
5	258 42.0	13.3
6	273 41.9	−19 13.9
7	288 41.8	14.5
8	303 41.6	15.1
9	318 41.5	15.7
10	333 41.4	16.2
11	348 41.2	16.8
12	3 41.1	−19 17.4
13	18 41.0	18.0
14	33 40.8	18.6
15	48 40.7	19.2
16	63 40.6	19.8
17	78 40.4	20.4
18	93 40.3	−19 21.0
19	108 40.2	21.6
20	123 40.0	22.2
21	138 39.9	22.7
22	153 39.8	23.3
23	168 39.6	23.9
19 0	183 39.5	−19 24.5
1	198 39.3	25.1
2	213 39.2	25.7
3	228 39.1	26.2
4	243 38.9	26.8
5	258 38.8	27.4
6	273 38.7	−19 28.0
7	288 38.5	28.6
8	303 38.4	29.2
9	318 38.2	29.7
10	333 38.1	30.3
11	348 38.0	30.9
12	3 37.8	−19 31.5
13	18 37.7	32.1
14	33 37.5	32.6
15	48 37.4	33.2
16	63 37.2	33.8
17	78 37.1	34.4
18	93 37.0	−19 34.9
19	108 36.8	35.5
20	123 36.7	36.1
21	138 36.5	36.6
22	153 36.4	37.2
23	168 36.2	37.8
24	183 36.1	−19 38.4
code	—	− 6

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 50.1	−40 28.6
5	Achernar	335 57.8	−57 27.4
30	Acrux	173 57.2	−62 51.4
19	Adhara	255 45.6	−28 54.7
10	Aldebaran	291 37.8	+16 25.5
32	Alioth	166 58.3	+56 11.4
34	Alkaid	153 32.7	+49 31.5
55	Al Na'ir	28 36.9	−47 10.3
15	Alnilam	276 29.1	− 1 13.7
25	Alphard	218 37.7	− 8 28.2
41	Alphecca	126 47.3	+26 51.6
1	Alpheratz	358 27.2	+28 51.4
51	Altair	62 49.8	+ 8 45.4
2	Ankaa	353 57.2	−42 32.4
42	Antares	113 18.7	−26 20.2
37	Arcturus	146 34.8	+19 24.4
43	Atria	108 59.2	−68 57.1
22	Avior	234 35.1	−59 22.0
13	Bellatrix	279 17.2	+ 6 18.7
16	Betelg'se	271 46.9	+ 7 24.0
17	Canopus	264 14.6	−52 40.2
12	Capella	281 36.7	+45 57.3
53	Deneb	50 00.5	+45 07.9
28	Denebola	183 17.1	+14 48.7
4	Diphda	349 38.2	−18 13.3
27	Dubhe	194 43.9	+61 58.7
14	Elnath	279 05.9	+28 34.3
47	Eltanin	91 06.3	+51 29.9
54	Enif	34 28.8	+ 9 40.8
56	Fomalhaut	16 10.6	−29 51.1
31	Gacrux	172 48.6	−56 52.1
29	Gienah	176 36.2	−17 18.1
35	Hadar	149 48.8	−60 09.8
6	Hamal	328 48.4	+23 15.7
48	Kaus Aust.	84 40.4	−34 24.4
40	Kochab	137 19.3	+74 19.8
57	Markab	14 20.5	+14 58.6
8	Menkar	314 59.1	+ 3 55.4
36	Menkent	148 58.0	−36 09.4
24	Miapl'dus	221 48.6	−69 32.1
9	Mirfak	309 40.6	+49 42.6
50	Nunki	76 51.1	−26 21.1
52	Peacock	54 26.3	−56 52.6
21	Pollux	244 19.4	+28 07.7
20	Procyon	245 43.9	+ 5 20.2
46	R'alhague	96 46.2	+12 35.6
26	Regulus	208 28.7	+12 10.6
11	Rigel	281 52.5	− 8 15.0
38	Rigil Kent.	140 50.4	−60 39.4
44	Sabik	103 01.6	−15 40.3
3	Schedar	350 28.6	+56 18.4
45	Shaula	97 19.9	−37 04.4
18	Sirius	259 10.9	−16 39.3
33	Spica	159 16.3	−10 56.2
23	Suhail	223 23.6	−43 15.3
49	Vega	81 08.0	+38 44.8
39	Zub'g'bi	137 52.8	−15 51.7

GMT	Equation of Time (App. − Mean) 17	18	19
h	m s	m s	m s
0	+15 02.9	+14 51.0	+14 38.2
6	+15 00.0	+14 47.9	+14 34.9
12	+14 57.1	+14 44.7	+14 31.5
18	+14 54.0	+14 41.5	+14 28.1
24	+14 51.0	+14 38.2	+14 24.6

Lat. N °	Sunrise h m	Twlt. begins h m	Moonrise 17 h m	18 h m	19 h m	20 h m
72	▬	5 47	12 01	▭	▭	▭
70	10 11	5 44	13 03	12 29	▭	▭
68	9 28	5 41	13 39	13 46	14 12	15 25
66	8 59	5 38	14 05	14 24	15 03	16 12
64	8 37	5 36	14 25	14 51	15 35	16 42
62	8 20	5 34	14 41	15 11	15 58	17 04
60	8 06	5 32	14 54	15 28	16 17	17 23
58	7 53	5 30	15 06	15 43	16 33	17 38
56	7 43	5 28	15 16	15 55	16 46	17 51
54	7 33	5 27	15 26	16 06	16 58	18 02
52	7 25	5 24	15 34	16 15	17 08	18 12
50	7 18	5 23	15 41	16 24	17 17	18 21
45	7 02	5 18	15 57	16 42	17 37	18 40
40	6 49	5 13	16 09	16 57	17 53	18 55
35	6 37	5 08	16 20	17 10	18 06	19 08
30	6 28	5 04	16 30	17 21	18 18	19 19
20	6 11	4 54	16 47	17 40	18 38	19 39
10	5 56	4 42	17 01	17 56	18 55	19 56
0	5 42	4 28	17 15	18 12	19 11	20 11
10	5 27	4 12	17 29	18 28	19 28	20 27
20	5 12	3 52	17 44	18 45	19 45	20 44
30	4 55	3 24	18 01	19 04	20 05	21 03
35	4 44	3 06	18 11	19 15	20 17	21 15
40	4 32	2 42	18 22	19 28	20 31	21 28
45	4 18	2 09	18 36	19 44	20 47	21 43
50	4 01	1 16	18 52	20 03	21 07	22 02
52	3 53	0 36	19 00	20 12	21 16	22 10
54	3 44	////	19 09	20 22	21 26	22 20
56	3 33	////	19 19	20 33	21 39	22 31
58	3 22	////	19 30	20 46	21 52	22 44
60	3 08	////	19 43	21 02	22 08	22 59

Lat. N °	Sunset h m	Twlt. ends h m	Moonset 17 h m	18 h m	19 h m	20 h m
72	▬	17 40	9 47	▭	▭	▭
70	13 19	17 44	8 46	11 17	▭	▭
68	14 02	17 46	8 11	10 01	11 37	12 30
66	14 31	17 49	7 46	9 23	10 47	11 44
64	14 53	17 52	7 27	8 57	10 15	11 13
62	15 10	17 54	7 11	8 37	9 52	10 51
60	15 24	17 56	6 58	8 20	9 33	10 32
58	15 36	17 57	6 47	8 06	9 17	10 17
56	15 47	18 00	6 37	7 54	9 04	10 04
54	15 57	18 03	6 29	7 43	8 52	9 52
52	16 05	18 04	6 21	7 34	8 42	9 42
50	16 12	18 06	6 14	7 26	8 33	9 33
45	16 28	18 11	5 59	7 08	8 14	9 14
40	16 42	18 16	5 47	6 54	7 58	8 58
35	16 53	18 21	5 37	6 42	7 45	8 45
30	17 03	18 26	5 28	6 31	7 33	8 33
20	17 20	18 37	5 13	6 13	7 13	8 14
10	17 35	18 48	4 59	5 57	6 56	7 56
0	17 49	19 02	4 47	5 42	6 40	7 40
10	18 03	19 18	4 34	5 27	6 24	7 24
20	18 18	19 39	4 21	5 11	6 07	7 06
30	18 36	20 07	4 05	4 53	5 47	6 46
35	18 47	20 27	3 57	4 43	5 35	6 35
40	18 59	20 51	3 47	4 31	5 22	6 21
45	19 13	21 24	3 35	4 16	5 06	6 05
50	19 30	22 18	3 21	3 59	4 47	5 46
52	19 39	23 03	3 14	3 51	4 38	5 36
54	19 48	////	3 07	3 42	4 28	5 26
56	19 58	////	2 58	3 32	4 16	5 14
58	20 10	////	2 49	3 20	4 03	5 00
60	20 24	////	2 39	3 07	3 47	4 44

GMT of Transit
Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
17	23 28	9 31	19 44	8 04	12 24
18	24 26	9 32	19 41	8 01	12 20
19	0 26	9 32	19 39	7 57	12 17
20	1 26	9 33	19 36	7 54	12 14

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.5	0.1	0.2
30	0.5	0.1	0.2
45	0.5	0.1	0.1
60	0.5	0.0	0.1
75	0.5	0.0	0.0
90			

Moon's Lower Limb
Add

Alt.	17	18	19
°	′	′	′
0	17.1	18.0	18.5
4	17.1	18.0	18.5
8	17.1	17.9	18.4
12	17.0	17.9	18.4
16	17.0	17.9	18.4
20	17.0	17.8	18.3
24	17.0	17.8	18.2
28	16.9	17.7	18.2
32	16.9	17.6	18.1
36	16.8	17.6	18.0
40	16.8	17.5	17.9
44	16.7	17.4	17.8
48	16.6	17.3	17.7
52	16.6	17.2	17.5
56	16.5	17.1	17.4
60	16.4	17.0	17.3
64	16.4	16.8	17.1
68	16.3	16.7	17.0
72	16.2	16.6	16.8
76	16.1	16.5	16.7
80	16.0	16.3	16.5
84	16.0	16.2	16.3
88	15.9	16.1	16.2
90			

Add to table, back cover

Moon's Upper Limb
Subtract

Alt.	17	18	19
°	′	′	′
0	14.7	14.2	13.9
4	14.7	14.2	13.9
8	14.7	14.2	13.9
12	14.7	14.2	13.9
16	14.7	14.3	14.0
20	14.8	14.3	14.0
24	14.8	14.4	14.1
28	14.8	14.4	14.2
32	14.9	14.5	14.3
36	14.9	14.6	14.4
40	15.0	14.7	14.5
44	15.0	14.7	14.6
48	15.1	14.8	14.7
52	15.2	15.0	14.8
56	15.2	15.1	15.0
60	15.3	15.2	15.1
64	15.4	15.3	15.2
68	15.5	15.4	15.4
72	15.5	15.5	15.5
76	15.6	15.7	15.7
80	15.7	15.8	15.9
84	15.8	15.9	16.0
88	15.9	16.0	16.1
90			

Subtract from table, back cover

Full Moon 18

GMT	♈ GHA	VENUS −3.5 GHA	Dec.	MARS −0.7 GHA	Dec.	JUPITER −1.4 GHA	Dec.	SATURN 0.7 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
20 00	58 58.9	216 48.7	− 7 17.1	65 23.9	− 4 02.7	241 14.6	+ 2 12.3	176 10.7	−19 22.5	339 26.4	50	+21 10.2	− 5
01	74 01.4	231 48.3	18.2	80 25.5	02.2	256 16.7	12.2	191 12.9	22.5	353 50.4	49	21 09.7	− 7
02	89 03.9	246 47.9	19.3	95 27.1	01.7	271 18.8	12.1	206 15.0	22.6	8 14.3	49	21 09.0	− 9
03	104 06.3	261 47.5	·· 20.4	110 28.6	·· 01.2	286 20.9	·· 11.9	221 17.2	·· 22.6	22 38.2	49	·21 08.1	− 10
04	119 08.8	276 47.1	21.5	125 30.2	00.6	301 23.1	11.8	236 19.4	22.7	37 02.1	50	21 07.1	− 11
05	134 11.2	291 46.7	22.6	140 31.8	4 00.1	316 25.2	11.6	251 21.5	22.7	51 26.1	49	21 06.0	− 13
06	149 13.7	306 46.3	− 7 23.7	155 33.3	− 3 59.6	331 27.3	+ 2 11.5	266 23.7	−19 22.8	65 50.0	49	+21 04.7	− 15
07	164 16.2	321 45.9	24.9	170 34.9	59.1	346 29.4	11.3	281 25.8	22.9	80 13.9	49	21 03.2	− 16
08	179 18.6	336 45.5	26.0	185 36.4	58.6	1 31.5	11.2	296 28.0	22.9	94 37.8	50	21 01.6	− 17
09	194 21.1	351 45.1	·· 27.1	200 38.0	·· 58.1	16 33.6	·· 11.1	311 30.1	·· 23.0	109 01.8	49	·20 59.9	− 19
10	209 23.6	6 44.7	28.2	215 39.6	57.5	31 35.7	10.9	326 32.3	23.0	123 25.7	49	20 58.0	− 20
11	224 26.0	21 44.3	29.3	230 41.1	57.0	46 37.9	10.8	341 34.5	23.1	137 49.6	50	20 56.0	− 21
12	239 28.5	36 43.9	− 7 30.4	245 42.7	− 3 56.5	61 40.0	+ 2 10.6	356 36.6	−19 23.1	152 13.6	49	+20 53.9	− 24
13	254 31.0	51 43.4	31.5	260 44.3	56.0	76 42.1	10.5	11 38.8	23.2	166 37.5	50	20 51.5	− 24
14	269 33.4	66 43.0	32.6	275 45.8	55.5	91 44.2	10.3	26 40.9	23.2	181 01.5	50	20 49.1	− 26
15	284 35.9	81 42.6	·· 33.8	290 47.4	·· 55.0	106 46.3	·· 10.2	41 43.1	·· 23.3	195 25.5	50	·20 46.5	− 27
16	299 38.4	96 42.2	34.9	305 48.9	54.4	121 48.4	10.1	56 45.2	23.4	209 49.5	50	20 43.8	− 29
17	314 40.8	111 41.8	36.0	320 50.5	53.9	136 50.5	09.9	71 47.4	23.4	224 13.5	50	20 40.9	− 30
18	329 43.3	126 41.4	− 7 37.1	335 52.1	− 3 53.4	151 52.7	+ 2 09.8	86 49.6	−19 23.5	238 37.5	51	+20 37.9	− 32
19	344 45.7	141 41.0	38.2	350 53.6	52.9	166 54.8	09.6	101 51.7	23.5	253 01.6	51	20 34.7	− 33
20	359 48.2	156 40.6	39.3	5 55.2	52.4	181 56.9	09.5	116 53.9	23.6	267 25.7	51	20 31.4	− 35
21	14 50.7	171 40.2	·· 40.4	20 56.7	·· 51.8	196 59.0	·· 09.3	131 56.0	·· 23.6	281 49.8	51	·20 27.9	− 36
22	29 53.1	186 39.8	41.5	35 58.3	51.3	212 01.1	09.2	146 58.2	23.7	296 13.9	51	20 24.3	− 37
23	44 55.6	201 39.4	42.6	50 59.8	50.8	227 03.2	09.1	162 00.3	23.8	310 38.0	52	20 20.6	− 38
21 00	59 58.1	216 39.0	− 7 43.8	66 01.4	− 3 50.3	242 05.4	+ 2 08.9	177 02.5	−19 23.8	325 02.2	52	+20 16.8	− 41
01	75 00.5	231 38.5	44.9	81 03.0	49.8	257 07.5	08.8	192 04.7	23.9	339 26.4	53	20 12.7	− 41
02	90 03.0	246 38.1	46.0	96 04.5	49.2	272 09.6	08.6	207 06.8	23.9	353 50.7	52	20 08.6	− 43
03	105 05.5	261 37.7	·· 47.1	111 06.1	·· 48.7	287 11.7	·· 08.5	222 09.0	·· 24.0	8 14.9	53	·20 04.3	− 44
04	120 07.9	276 37.3	48.2	126 07.6	48.2	302 13.8	08.4	237 11.1	24.0	22 39.2	53	19 59.9	− 46
05	135 10.4	291 36.9	49.3	141 09.2	47.7	317 15.9	08.2	252 13.3	24.1	37 03.5	54	19 55.3	− 47
06	150 12.8	306 36.5	− 7 50.4	156 10.7	− 3 47.2	332 18.1	+ 2 08.1	267 15.4	−19 24.1	51 27.9	54	+19 50.6	− 48
07	165 15.3	321 36.1	51.5	171 12.3	46.6	347 20.2	07.9	282 17.6	24.2	65 52.3	55	19 45.8	− 49
08	180 17.8	336 35.7	52.6	186 13.8	46.1	2 22.3	07.8	297 19.7	24.3	80 16.8	54	19 40.9	− 51
09	195 20.2	351 35.2	·· 53.7	201 15.4	·· 45.6	17 24.4	·· 07.7	312 21.9	·· 24.3	94 41.2	56	·19 35.8	− 53
10	210 22.7	6 34.8	54.8	216 16.9	45.1	32 26.5	07.5	327 24.1	24.4	109 05.8	55	19 30.5	− 53
11	225 25.2	21 34.4	55.9	231 18.5	44.5	47 28.6	07.4	342 26.2	24.4	123 30.3	56	19 25.2	− 55
12	240 27.6	36 34.0	− 7 57.1	246 20.0	− 3 44.0	62 30.8	+ 2 07.2	357 28.4	−19 24.5	137 54.9	57	+19 19.7	− 56
13	255 30.1	51 33.6	58.2	261 21.6	43.5	77 32.9	07.1	12 30.5	24.5	152 19.6	57	19 14.1	− 58
14	270 32.6	66 33.2	7 59.3	276 23.1	43.0	92 35.0	07.0	27 32.7	24.6	166 44.3	57	19 08.3	− 59
15	285 35.0	81 32.8	· 8 00.4	291 24.7	·· 42.5	107 37.1	·· 06.8	42 34.8	·· 24.6	181 09.0	58	·19 02.4	− 60
16	300 37.5	96 32.3	01.5	306 26.2	41.9	122 39.2	06.7	57 37.0	24.7	195 33.8	59	18 56.4	− 61
17	315 40.0	111 31.9	02.6	321 27.7	41.4	137 41.4	06.5	72 39.2	24.8	209 58.7	58	18 50.3	− 62
18	330 42.4	126 31.5	− 8 03.7	336 29.3	− 3 40.9	152 43.5	+ 2 06.4	87 41.3	−19 24.8	224 23.5	60	+18 44.1	− 64
19	345 44.9	141 31.1	04.8	351 30.8	40.4	167 45.6	06.3	102 43.5	24.9	238 48.5	60	18 37.7	− 65
20	0 47.3	156 30.7	05.9	6 32.4	39.8	182 47.7	06.1	117 45.6	24.9	253 13.5	60	18 31.2	− 67
21	15 49.8	171 30.3	·· 07.0	21 33.9	·· 39.3	197 49.8	·· 06.0	132 47.8	·· 25.0	267 38.5	61	·18 24.5	− 67
22	30 52.3	186 29.8	08.1	36 35.5	38.8	212 52.0	05.8	147 49.9	25.0	282 03.6	61	18 17.8	− 69
23	45 54.7	201 29.4	09.2	51 37.0	38.3	227 54.1	05.7	162 52.1	25.1	296 28.7	63	18 10.9	− 69
22 00	60 57.2	216 29.0	− 8 10.3	66 38.5	− 3 37.7	242 56.2	+ 2 05.6	177 54.2	−19 25.1	310 54.0	62	+18 04.0	− 71
01	75 59.7	231 28.6	11.4	81 40.1	37.2	257 58.3	05.4	192 56.4	25.2	325 19.2	63	17 56.9	− 73
02	91 02.1	246 28.2	12.5	96 41.6	36.7	273 00.4	05.3	207 58.6	25.3	339 44.5	64	17 49.6	− 73
03	106 04.6	261 27.7	·· 13.6	111 43.2	·· 36.2	288 02.6	·· 05.1	223 00.7	·· 25.3	354 09.9	64	·17 42.3	− 75
04	121 07.1	276 27.3	14.7	126 44.7	35.6	303 04.7	05.0	238 02.9	25.4	8 35.3	65	17 34.8	− 75
05	136 09.5	291 26.9	15.8	141 46.2	35.1	318 06.8	04.9	253 05.0	25.4	23 00.8	65	17 27.3	− 77
06	151 12.0	306 26.5	− 8 16.9	156 47.8	− 3 34.6	333 08.9	+ 2 04.7	268 07.2	−19 25.5	37 26.3	66	+17 19.6	− 78
07	166 14.5	321 26.1	18.0	171 49.3	34.1	348 11.1	04.6	283 09.3	25.5	51 51.9	67	17 11.8	− 79
08	181 16.9	336 25.6	19.1	186 50.8	33.5	3 13.2	04.4	298 11.5	25.6	66 17.6	67	17 03.9	− 80
09	196 19.4	351 25.2	·· 20.2	201 52.4	·· 33.0	18 15.3	·· 04.3	313 13.7	·· 25.7	80 43.3	68	·16 55.9	− 81
10	211 21.8	6 24.8	21.4	216 53.9	32.5	33 17.4	04.2	328 15.8	25.7	95 09.1	68	16 47.8	− 82
11	226 24.3	21 24.4	22.5	231 55.5	32.0	48 19.5	04.0	343 18.0	25.8	109 34.9	69	16 39.6	− 83
12	241 26.8	36 24.0	− 8 23.6	246 57.0	− 3 31.4	63 21.7	+ 2 03.9	358 20.1	−19 25.8	124 00.8	70	+16 31.3	− 85
13	256 29.2	51 23.5	24.7	261 58.5	30.9	78 23.8	03.7	13 22.3	25.9	138 26.8	70	16 22.8	− 85
14	271 31.7	66 23.1	25.8	277 00.1	30.4	93 25.9	03.6	28 24.4	25.9	152 52.8	71	16 14.3	− 86
15	286 34.2	81 22.7	·· 26.9	292 01.6	·· 29.9	108 28.0	·· 03.5	43 26.6	·· 26.0	167 18.9	72	·16 05.7	− 88
16	301 36.6	96 22.3	28.0	307 03.1	29.3	123 30.2	03.3	58 28.7	26.0	181 45.1	72	15 56.9	− 88
17	316 39.1	111 21.8	29.1	322 04.6	28.8	138 32.3	03.2	73 30.9	26.1	196 11.3	73	15 48.1	− 89
18	331 41.6	126 21.4	− 8 30.2	337 06.2	− 3 28.3	153 34.4	+ 2 03.1	88 33.1	−19 26.2	210 37.6	73	+15 39.2	− 90
19	346 44.0	141 21.0	31.3	352 07.7	27.7	168 36.5	02.9	103 35.2	26.2	225 03.9	74	15 30.2	− 92
20	1 46.5	156 20.6	32.4	7 09.2	27.2	183 38.7	02.8	118 37.4	26.3	239 30.3	75	15 21.0	− 92
21	16 49.0	171 20.1	·· 33.5	22 10.8	·· 26.7	198 40.8	·· 02.6	133 39.5	·· 26.3	253 56.8	75	·15 11.8	− 93
22	31 51.4	186 19.7	34.6	37 12.3	26.2	213 42.9	02.5	148 41.7	26.4	268 23.3	76	15 02.5	− 94
23	46 53.9	201 19.3	35.6	52 13.8	25.6	228 45.0	02.4	163 43.8	26.4	282 49.9	76	14 53.1	− 95
24	61 56.3	216 18.9	− 8 36.7	67 15.3	− 3 25.1	243 47.2	+ 2 02.2	178 46.0	−19 26.5	297 16.5	78	+14 43.6	− 95
code	—	− 4	− 11	+ 16	+ 5	+ 21	− 1	+ 21	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
20 00	183 36.1	−19 38.4	7	Acamar	315 50.1	−40 28.6
01	198 35.9	38.9	5	Achernar	335 57.8	−57 27.4
02	213 35.8	39.5	30	Acrux	173 57.2	−62 51.4
03	228 35.6	·· 40.1	19	Adhara	255 45.6	−28 54.7
04	243 35.5	40.6	10	Aldebaran	291 37.8	+16 25.5
05	258 35.4	41.2				
06	273 35.2	−19 41.8	32	Alioth	166 58.3	+56 11.4
07	288 35.1	42.3	34	Alkaid	153 32.7	+49 31.5
08	303 34.9	42.9	55	Al Na'ir	28 36.9	−47 10.3
09	318 34.8	·· 43.5	15	Alnilam	276 29.1	− 1 13.7
10	333 34.6	44.0	25	Alphard	218 37.7	− 8 28.3
11	348 34.5	44.6				
12	3 34.3	−19 45.2	41	Alphecca	126 47.3	+26 51.6
13	18 34.2	45.7	1	Alpheratz	358 27.2	+28 51.4
14	33 34.0	46.3	51	Altair	62 49.8	+ 8 45.4
15	48 33.9	·· 46.9	2	Ankaa	353 57.2	−42 32.4
16	63 33.7	47.4	42	Antares	113 18.7	−26 20.2
17	78 33.6	48.0				
18	93 33.4	−19 48.5	37	Arcturus	146 34.7	+19 24.4
19	108 33.3	49.1	43	Atria	108 59.2	−68 57.1
20	123 33.1	49.6	22	Avior	234 35.1	−59 22.0
21	138 32.9	·· 50.2	13	Bellatrix	279 17.2	+ 6 18.7
22	153 32.8	50.8	16	Betelg'se	271 46.9	+ 7 24.0
23	168 32.6	51.3				
			17	Canopus	264 14.5	−52 40.2
21 00	183 32.5	−19 51.9	12	Capella	281 36.7	+45 57.3
01	198 32.3	52.4	53	Deneb	50 00.6	+45 07.9
02	213 32.2	53.0	28	Denebola	183 17.0	+14 48.7
03	228 32.0	·· 53.5	4	Diphda	349 38.2	−18 13.3
04	243 31.9	54.1				
05	258 31.7	54.6	27	Dubhe	194 43.8	+61 58.7
06	273 31.5	−19 55.2	14	Elnath	279 05.9	+28 34.3
07	288 31.4	55.8	47	Eltanin	91 06.3	+51 29.8
08	303 31.2	56.3	54	Enif	34 28.8	+ 9 40.8
09	318 31.1	·· 56.9	56	Fomalhaut	16 10.6	−29 51.1
10	333 30.9	57.4				
11	348 30.8	58.0	31	Gacrux	172 48.6	−56 52.1
12	3 30.6	−19 58.5	29	Gienah	176 36.2	−17 18.1
13	18 30.4	59.0	35	Hadar	149 48.7	−60 09.8
14	33 30.3	19 59.6	6	Hamal	328 48.4	+23 15.7
15	48 30.1	·20 00.1	48	Kaus Aust.	84 40.4	−34 24.4
16	63 30.0	00.7				
17	78 29.8	01.2	40	Kochab	137 19.3	+74 19.8
18	93 29.6	−20 01.8	57	Markab	14 20.5	+14 58.6
19	108 29.5	02.3	8	Menkar	314 59.1	+ 3 55.4
20	123 29.3	02.9	36	Menkent	148 58.0	−36 09.4
21	138 29.2	·· 03.4	24	Miapl'dus	221 48.5	−69 32.2
22	153 29.0	03.9				
23	168 28.8	04.5	9	Mirfak	309 40.6	+49 42.7
			50	Nunki	76 51.1	−26 21.1
22 00	183 28.7	−20 05.0	52	Peacock	54 26.3	−56 52.6
01	198 28.5	05.6	21	Pollux	244 19.3	+28 07.7
02	213 28.3	06.1	20	Procyon	245 43.9	+ 5 20.1
03	228 28.2	·· 06.6				
04	243 28.0	07.2	46	R'alhague	96 46.2	+12 35.6
05	258 27.9	07.7	26	Regulus	208 28.6	+12 10.6
06	273 27.7	−20 08.3	11	Rigel	281 52.5	− 8 15.0
07	288 27.5	08.8	38	Rigil Kent.	140 50.4	−60 39.4
08	303 27.4	09.3	44	Sabik	103 01.6	−15 40.3
09	318 27.2	·· 09.9				
10	333 27.0	10.4	3	Schedar	350 28.6	+56 18.4
11	348 26.9	10.9	45	Shaula	97 19.9	−37 04.4
12	3 26.7	−20 11.5	18	Sirius	259 10.8	−16 39.3
13	18 26.5	12.0	33	Spica	159 16.3	−10 56.2
14	33 26.4	12.5	23	Suhail	223 23.6	−43 15.3
15	48 26.2	·· 13.1				
16	63 26.0	13.6	49	Vega	81 08.0	+38 44.8
17	78 25.9	14.1	39	Zub'g'bi	137 52.8	−15 51.7
18	93 25.7	−20 14.6				
19	108 25.5	15.2				
20	123 25.3	15.7				
21	138 25.2	·· 16.2				
22	153 25.0	16.8				
23	168 24.8	17.3				
24	183 24.7	−20 17.8				
code	—	− 5				

Lat.	Sunrise	Twlt. begins	Moonrise 20	21	22	23
N °	h m	h m	h m	h m	h m	h m
72	▬	5 56	▭	▭	18 03	20 28
70	10 36	5 51	▭	16 23	18 43	20 47
68	9 42	5 48	15 25	17 14	19 09	21 02
66	9 10	5 45	16 12	17 45	19 30	21 15
64	8 47	5 43	16 42	18 09	19 46	21 25
62	8 28	5 40	17 04	18 27	19 59	21 34
60	8 13	5 37	17 23	18 43	20 11	21 41
58	8 00	5 35	17 38	18 55	20 20	21 48
56	7 49	5 33	17 51	19 07	20 29	21 53
54	7 39	5 31	18 02	19 16	20 36	21 58
52	7 30	5 29	18 12	19 25	20 43	22 03
50	7 22	5 27	18 21	19 33	20 49	22 07
45	7 06	5 21	18 40	19 49	21 02	22 16
40	6 52	5 16	18 55	20 03	21 13	22 24
35	6 40	5 11	19 08	20 14	21 22	22 30
30	6 30	5 06	19 19	20 24	21 30	22 36
20	6 12	4 55	19 39	20 42	21 44	22 45
10	5 57	4 43	19 56	20 57	21 56	22 54
0	5 42	4 29	20 11	21 11	22 07	23 02
10	5 28	4 13	20 27	21 25	22 19	23 10
20	5 12	3 51	20 44	21 39	22 31	23 18
30	4 53	3 22	21 03	21 56	22 44	23 28
35	4 43	3 03	21 15	22 06	22 52	23 33
40	4 30	2 38	21 28	22 18	23 01	23 39
45	4 15	2 03	21 43	22 31	23 12	23 47
50	3 57	1 04	22 02	22 47	23 24	23 55
52	3 49	0 05	22 10	22 55	23 30	23 59
54	3 39	////	22 20	23 03	23 36	24 04
56	3 28	////	22 31	23 12	23 44	24 08
58	3 16	////	22 44	23 23	23 52	24 14
60	3 01	////	22 59	23 35	24 01	0 01
S						

Lat.	Sunset	Twlt. ends	Moonset 20	21	22	23
N °	h m	h m	h m	h m	h m	h m
72	▬	17 32	▭	▭	13 59	13 29
70	12 55	17 37	▭	13 38	13 18	13 08
68	13 49	17 41	12 30	12 46	12 50	12 51
66	14 21	17 44	11 44	12 14	12 29	12 38
64	14 45	17 47	11 13	11 50	12 12	12 26
62	15 03	17 49	10 51	11 31	11 58	12 16
60	15 18	17 51	10 32	11 15	11 46	12 08
58	15 31	17 54	10 17	11 02	11 35	12 01
56	15 43	17 57	10 04	10 50	11 26	11 54
54	15 52	17 59	9 52	10 40	11 18	11 48
52	16 01	18 01	9 42	10 31	11 11	11 43
50	16 09	18 04	9 33	10 23	11 04	11 38
45	16 26	18 09	9 14	10 06	10 50	11 28
40	16 40	18 15	8 58	9 52	10 38	11 19
35	16 51	18 19	8 45	9 40	10 28	11 11
30	17 02	18 25	8 33	9 29	10 19	11 05
20	17 19	18 36	8 14	9 11	10 04	10 53
10	17 35	18 49	7 56	8 55	9 51	10 43
0	17 49	19 02	7 40	8 40	9 38	10 33
10	18 04	19 20	7 24	8 25	9 25	10 24
20	18 20	19 41	7 06	8 09	9 11	10 13
30	18 39	20 11	6 46	7 50	8 56	10 01
35	18 50	20 31	6 35	7 39	8 47	9 54
40	19 02	20 55	6 21	7 27	8 36	9 47
45	19 17	21 31	6 05	7 12	8 24	9 37
50	19 35	22 31	5 46	6 54	8 08	9 26
52	19 44	////	5 36	6 45	8 01	9 21
54	19 54	////	5 26	6 36	7 53	9 15
56	20 05	////	5 14	6 25	7 44	9 08
58	20 18	////	5 00	6 12	7 34	9 01
60	20 32	////	4 44	5 58	7 23	8 53
S						

GMT	Equation of Time (App. − Mean) 20	21	22
h	m s	m s	m s
0	+14 24.6	+14 10.2	+13 55.0
6	+14 21.1	+14 06.5	+13 51.1
12	+14 17.5	+14 02.7	+13 47.1
18	+14 13.9	+13 58.9	+13 43.1
24	+14 10.2	+13 55.0	+13 39.0

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
20	1 26	9 33	19 36	7 54	12 14
21	2 26	9 34	19 34	7 51	12 10
22	3 24	9 34	19 31	7 47	12 07
23	4 21	9 35	19 29	7 44	12 03

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.5	0.1	0.2
30	0.5	0.1	0.2
45	0.5	0.1	0.1
60	0.5	0.0	0.1
75	0.5	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	20	21	22
°	′	′	′
0	18.9	19.1	19.0
4	18.8	19.1	19.0
8	18.8	19.1	18.9
12	18.8	19.0	18.9
16	18.7	19.0	18.9
20	18.7	18.9	18.8
24	18.6	18.8	18.7
28	18.5	18.7	18.6
32	18.4	18.6	18.5
36	18.3	18.5	18.4
40	18.2	18.4	18.3
44	18.1	18.3	18.2
48	17.9	18.1	18.0
52	17.8	18.0	17.9
56	17.6	17.8	17.7
60	17.5	17.6	17.6
64	17.3	17.5	17.4
68	17.1	17.3	17.2
72	17.0	17.1	17.0
76	16.8	16.9	16.8
80	16.6	16.7	16.7
84	16.4	16.5	16.5
88	16.3	16.4	16.3
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	20	21	22
°	′	′	′
0	13.7	13.5	13.6
4	13.7	13.5	13.6
8	13.7	13.6	13.6
12	13.7	13.6	13.7
16	13.8	13.6	13.7
20	13.8	13.7	13.8
24	13.9	13.8	13.9
28	14.0	13.9	13.9
32	14.1	14.0	14.0
36	14.2	14.1	14.2
40	14.3	14.2	14.3
44	14.5	14.4	14.4
48	14.6	14.5	14.5
52	14.7	14.7	14.7
56	14.9	14.8	14.9
60	15.0	15.0	15.0
64	15.2	15.2	15.2
68	15.4	15.4	15.4
72	15.5	15.5	15.5
76	15.7	15.7	15.7
80	15.9	15.9	15.9
84	16.1	16.1	16.1
88	16.2	16.3	16.2
90			

Subtract from table, back cover

Thanksgiving Day 22

GMT	♈ GHA	VENUS −3.5 GHA	VENUS −3.5 Dec.	MARS −0.6 GHA	MARS −0.6 Dec.	JUPITER −1.4 GHA	JUPITER −1.4 Dec.	SATURN 0.7 GHA	SATURN 0.7 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
23 0	61 56.3	216 18.9	− 8 36.7	67 15.3	− 3 25.1	243 47.2	+ 2 02.2	178 46.0	−19 26.5	297 16.5	78	+14 43.6	− 95
1	76 58.8	231 18.4	37.8	82 16.9	24.6	258 49.3	02.1	193 48.1	26.5	311 43.3	77	14 34.1	− 97
2	92 01.3	246 18.0	38.9	97 18.4	24.0	273 51.4	02.0	208 50.3	26.6	326 10.0	79	14 24.4	− 97
3	107 03.7	261 17.6	·· 40.0	112 19.9	·· 23.5	288 53.5	·· 01.8	223 52.5	·· 26.7	340 36.9	79	·14 14.7	− 99
4	122 06.2	276 17.1	41.1	127 21.4	23.0	303 55.7	01.7	238 54.6	26.7	355 03.8	80	14 04.8	− 99
5	137 08.7	291 16.7	42.2	142 23.0	22.5	318 57.8	01.5	253 56.8	26.8	9 30.8	80	13 54.9	−100
6	152 11.1	306 16.3	− 8 43.3	157 24.5	− 3 21.9	333 59.9	+ 2 01.4	268 58.9	−19 26.8	23 57.8	81	+13 44.9	−101
7	167 13.6	321 15.9	44.4	172 26.0	21.4	349 02.0	01.3	284 01.1	26.9	38 24.9	82	13 34.8	−101
8	182 16.1	336 15.4	45.5	187 27.5	20.9	4 04.2	01.1	299 03.2	26.9	52 52.1	82	13 24.7	−102
9	197 18.5	351 15.0	·· 46.6	202 29.1	·· 20.3	19 06.3	·· 01.0	314 05.4	·· 27.0	67 19.3	83	·13 14.5	−104
10	212 21.0	6 14.6	47.7	217 30.6	19.8	34 08.4	00.9	329 07.5	27.0	81 46.6	84	13 04.1	−103
11	227 23.5	21 14.1	48.8	232 32.1	19.3	49 10.5	00.7	344 09.7	27.1	96 14.0	84	12 53.8	−105
12	242 25.9	36 13.7	− 8 49.9	247 33.6	− 3 18.8	64 12.7	+ 2 00.6	359 11.9	−19 27.2	110 41.4	85	+12 43.3	−105
13	257 28.4	51 13.3	51.0	262 35.1	18.2	79 14.8	00.4	14 14.0	27.2	125 08.9	85	12 32.8	−106
14	272 30.8	66 12.8	52.1	277 36.7	17.7	94 16.9	00.3	29 16.2	27.3	139 36.4	86	12 22.2	−107
15	287 33.3	81 12.4	·· 53.2	292 38.2	·· 17.2	109 19.1	·· 00.2	44 18.3	·· 27.3	154 04.0	87	·12 11.5	−107
16	302 35.8	96 12.0	54.3	307 39.7	16.6	124 21.2	2 00.0	59 20.5	27.4	168 31.7	87	12 00.8	−109
17	317 38.2	111 11.5	55.4	322 41.2	16.1	139 23.3	1 59.9	74 22.6	27.4	182 59.4	88	11 49.9	−108
18	332 40.7	126 11.1	− 8 56.5	337 42.7	− 3 15.6	154 25.4	+ 1 59.8	89 24.8	−19 27.5	197 27.2	88	+11 39.1	−110
19	347 43.2	141 10.7	57.6	352 44.3	15.0	169 27.6	59.6	104 26.9	27.5	211 55.0	89	11 28.1	−110
20	2 45.6	156 10.2	58.7	7 45.8	14.5	184 29.7	59.5	119 29.1	27.6	226 22.9	90	11 17.1	−110
21	17 48.1	171 09.8	· 8 59.7	22 47.3	·· 14.0	199 31.8	·· 59.4	134 31.3	·· 27.6	240 50.9	90	·11 06.1	−112
22	32 50.6	186 09.4	9 00.8	37 48.8	13.4	214 34.0	59.2	149 33.4	27.7	255 18.9	91	10 54.9	−111
23	47 53.0	201 08.9	01.9	52 50.3	12.9	229 36.1	59.1	164 35.6	27.8	269 47.0	91	10 43.8	−113
24 0	62 55.5	216 08.5	− 9 03.0	67 51.8	− 3 12.4	244 38.2	+ 1 59.0	179 37.7	−19 27.8	284 15.1	92	+10 32.5	−113
1	77 57.9	231 08.1	04.1	82 53.3	11.8	259 40.3	58.8	194 39.9	27.9	298 43.3	93	10 21.2	−113
2	93 00.4	246 07.6	05.2	97 54.9	11.3	274 42.5	58.7	209 42.0	27.9	313 11.6	93	10 09.9	−114
3	108 02.9	261 07.2	·· 06.3	112 56.4	·· 10.8	289 44.6	·· 58.5	224 44.2	·· 28.0	327 39.9	93	· 9 58.5	−115
4	123 05.3	276 06.7	07.4	127 57.9	10.2	304 46.7	58.4	239 46.3	28.0	342 08.2	94	9 47.0	−115
5	138 07.8	291 06.3	08.5	142 59.4	09.7	319 48.9	58.3	254 48.5	28.1	356 36.6	95	9 35.5	−116
6	153 10.3	306 05.9	− 9 09.6	158 00.9	− 3 09.2	334 51.0	+ 1 58.1	269 50.7	−19 28.1	11 05.1	95	+ 9 23.9	−116
7	168 12.7	321 05.4	10.7	173 02.4	08.6	349 53.1	58.0	284 52.8	28.2	25 33.6	96	9 12.3	−116
8	183 15.2	336 05.0	11.7	188 03.9	08.1	4 55.3	57.9	299 55.0	28.3	40 02.2	96	9 00.7	−117
9	198 17.7	351 04.5	·· 12.8	203 05.4	·· 07.6	19 57.4	·· 57.7	314 57.1	·· 28.3	54 30.8	97	· 8 49.0	−118
10	213 20.1	6 04.1	13.9	218 06.9	07.0	34 59.5	57.6	329 59.3	28.4	68 59.5	97	8 37.2	−118
11	228 22.6	21 03.7	15.0	233 08.4	06.5	50 01.7	57.5	345 01.4	28.4	83 28.2	98	8 25.4	−118
12	243 25.1	36 03.2	− 9 16.1	248 09.9	− 3 06.0	65 03.8	+ 1 57.3	0 03.6	−19 28.5	97 57.0	99	+ 8 13.6	−119
13	258 27.5	51 02.8	17.2	263 11.4	05.4	80 05.9	57.2	15 05.7	28.5	112 25.9	99	8 01.7	−119
14	273 30.0	66 02.3	18.3	278 13.0	04.9	95 08.1	57.1	30 07.9	28.6	126 54.8	99	7 49.8	−120
15	288 32.4	81 01.9	·· 19.4	293 14.5	·· 04.4	110 10.2	·· 56.9	45 10.1	·· 28.6	141 23.7	100	· 7 37.8	−119
16	303 34.9	96 01.5	20.5	308 16.0	03.8	125 12.3	56.8	60 12.2	28.7	155 52.7	100	7 25.9	−121
17	318 37.4	111 01.0	21.5	323 17.5	03.3	140 14.4	56.7	75 14.4	28.8	170 21.7	101	7 13.8	−120
18	333 39.8	126 00.6	− 9 22.6	338 19.0	− 3 02.8	155 16.6	+ 1 56.5	90 16.5	−19 28.8	184 50.8	101	+ 7 01.8	−121
19	348 42.3	141 00.1	23.7	353 20.5	02.2	170 18.7	56.4	105 18.7	28.9	199 19.9	101	6 49.7	−122
20	3 44.8	155 59.7	24.8	8 22.0	01.7	185 20.8	56.3	120 20.8	28.9	213 49.0	102	6 37.5	−121
21	18 47.2	170 59.3	·· 25.9	23 23.5	·· 01.2	200 23.0	·· 56.1	135 23.0	·· 29.0	228 18.2	103	· 6 25.4	−122
22	33 49.7	185 58.8	27.0	38 25.0	00.6	215 25.1	56.0	150 25.1	29.0	242 47.5	103	6 13.2	−122
23	48 52.2	200 58.4	28.1	53 26.5	3 00.1	230 27.2	55.9	165 27.3	29.1	257 16.8	103	6 01.0	−122
25 0	63 54.6	215 57.9	− 9 29.1	68 28.0	− 2 59.5	245 29.4	+ 1 55.7	180 29.5	−19 29.1	271 46.1	104	+ 5 48.8	−123
1	78 57.1	230 57.5	30.2	83 29.5	59.0	260 31.5	55.6	195 31.6	29.2	286 15.5	104	5 36.5	−123
2	93 59.6	245 57.0	31.3	98 31.0	58.5	275 33.7	55.5	210 33.8	29.2	300 44.9	105	5 24.2	−123
3	109 02.0	260 56.6	·· 32.4	113 32.5	·· 57.9	290 35.8	·· 55.3	225 35.9	·· 29.3	315 14.4	105	· 5 11.9	−124
4	124 04.5	275 56.1	33.5	128 34.0	57.4	305 37.9	55.2	240 38.1	29.4	329 43.9	105	4 59.5	−123
5	139 06.9	290 55.7	34.6	143 35.5	56.9	320 40.1	55.1	255 40.2	29.4	344 13.4	106	4 47.2	−124
6	154 09.4	305 55.2	− 9 35.6	158 37.0	− 2 56.3	335 42.2	+ 1 54.9	270 42.4	−19 29.5	358 43.0	106	+ 4 34.8	−124
7	169 11.9	320 54.8	36.7	173 38.5	55.8	350 44.3	54.8	285 44.5	29.5	13 12.6	106	4 22.4	−124
8	184 14.3	335 54.3	37.8	188 40.0	55.2	5 46.5	54.7	300 46.7	29.6	27 42.2	107	4 10.0	−124
9	199 16.8	350 53.9	·· 38.9	203 41.5	·· 54.7	20 48.6	·· 54.5	315 48.8	·· 29.6	42 11.9	107	· 3 57.6	−125
10	214 19.3	5 53.4	40.0	218 43.0	54.2	35 50.7	54.4	330 51.0	29.7	56 41.6	107	3 45.1	−124
11	229 21.7	20 53.0	41.0	233 44.4	53.6	50 52.9	54.3	345 53.2	29.7	71 11.3	108	3 32.7	−125
12	244 24.2	35 52.5	− 9 42.1	248 45.9	− 2 53.1	65 55.0	+ 1 54.1	0 55.3	−19 29.8	85 41.1	108	+ 3 20.2	−125
13	259 26.7	50 52.1	43.2	263 47.4	52.6	80 57.1	54.0	15 57.5	29.9	100 10.9	108	3 07.7	−125
14	274 29.1	65 51.6	44.3	278 48.9	52.0	95 59.3	53.9	30 59.6	29.9	114 40.7	109	2 55.2	−125
15	289 31.6	80 51.2	·· 45.4	293 50.4	·· 51.5	111 01.4	·· 53.7	46 01.8	·· 30.0	129 10.6	109	· 2 42.7	−125
16	304 34.0	95 50.7	46.4	308 51.9	50.9	126 03.6	53.6	61 03.9	30.0	143 40.5	109	2 30.2	−125
17	319 36.5	110 50.3	47.5	323 53.4	50.4	141 05.7	53.5	76 06.1	30.1	158 10.4	110	2 17.7	−125
18	334 39.0	125 49.8	− 9 48.6	338 54.9	− 2 49.9	156 07.8	+ 1 53.3	91 08.2	−19 30.1	172 40.4	109	+ 2 05.2	−126
19	349 41.4	140 49.4	49.7	353 56.4	49.3	171 10.0	53.2	106 10.4	30.2	187 10.3	110	1 52.6	−125
20	4 43.9	155 48.9	50.8	8 57.9	48.8	186 12.1	53.1	121 12.5	30.2	201 40.3	111	1 40.1	−125
21	19 46.4	170 48.5	·· 51.8	23 59.4	·· 48.2	201 14.2	·· 52.9	136 14.7	·· 30.3	216 10.4	110	· 1 27.6	−126
22	34 48.8	185 48.0	52.9	39 00.9	47.7	216 16.4	52.8	151 16.9	30.3	230 40.4	111	1 15.0	−125
23	49 51.3	200 47.6	54.0	54 02.3	47.2	231 18.5	52.7	166 19.0	30.4	245 10.5	111	1 02.5	−125
24	64 53.8	215 47.1	− 9 55.1	69 03.8	− 2 46.6	246 20.7	+ 1 52.6	181 21.2	−19 30.5	259 40.6	111	+ 0 50.0	−125
code	—	− 4	− 11	+ 15	+ 6	+ 21	− 1	+ 21	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
23 00	183 24.7	−20 17.8	7	Acamar	315 50.1	−40 28.6
01	198 24.5	18.3	5	Achernar	335 57.8	−57 27.4
02	213 24.3	18.9	30	Acrux	173 57.2	−62 51.4
03	228 24.1	·· 19.4	19	Adhara	255 45.6	−28 54.7
04	243 24.0	19.9	10	Aldebaran	291 37.7	+16 25.5
05	258 23.8	20.4				
06	273 23.6	−20 20.9	32	Alioth	166 58.3	+56 11.4
07	288 23.4	21.5	34	Alkaid	153 32.7	+49 31.5
08	303 23.3	22.0	55	Al Na'ir	28 37.0	−47 10.3
09	318 23.1	·· 22.5	15	Alnilam	276 29.1	− 1 13.7
10	333 22.9	23.0	25	Alphard	218 37.7	− 8 28.3
11	348 22.8	23.5				
12	3 22.6	−20 24.1	41	Alphecca	126 47.3	+26 51.6
13	18 22.4	24.6	1	Alpheratz	358 27.2	+28 51.4
14	33 22.2	25.1	51	Altair	62 49.8	+ 8 45.4
15	48 22.0	·· 25.6	2	Ankaa	353 57.3	−42 32.4
16	63 21.9	26.1	42	Antares	113 18.7	−26 20.2
17	78 21.7	26.6				
18	93 21.5	−20 27.2	37	Arcturus	146 34.7	+19 24.3
19	108 21.3	27.7	43	Atria	108 59.2	−68 57.1
20	123 21.2	28.2	22	Avior	234 35.1	−59 22.0
21	138 21.0	·· 28.7	13	Bellatrix	279 17.2	+ 6 18.7
22	153 20.8	29.2	16	Betelg'se	271 46.9	+ 7 24.0
23	168 20.6	29.7				
			17	Canopus	264 14.5	−52 40.2
24 00	183 20.4	−20 30.2	12	Capella	281 36.7	+45 57.3
01	198 20.3	30.7	53	Deneb	50 00.6	+45 07.9
02	213 20.1	31.2	28	Denebola	183 17.0	+14 48.7
03	228 19.9	·· 31.7	4	Diphda	349 38.2	−18 13.3
04	243 19.7	32.3				
05	258 19.5	32.8	27	Dubhe	194 43.8	+61 58.7
06	273 19.4	−20 33.3	14	Elnath	279 05.9	+28 34.3
07	288 19.2	33.8	47	Eltanin	91 06.3	+51 29.8
08	303 19.0	34.3	54	Enif	34 28.8	+ 9 40.8
09	318 18.8	·· 34.8	56	Fomalhaut	16 10.7	−29 51.1
10	333 18.6	35.3				
11	348 18.4	35.8	31	Gacrux	172 48.6	−56 52.1
12	3 18.3	−20 36.3	29	Gienah	176 36.2	−17 18.1
13	18 18.1	36.8	35	Hadar	149 48.7	−60 09.8
14	33 17.9	37.3	6	Hamal	328 48.4	+23 15.7
15	48 17.7	·· 37.8	48	Kaus Aust.	84 40.4	−34 24.4
16	63 17.5	38.3				
17	78 17.3	38.8	40	Kochab	137 19.3	+74 19.8
18	93 17.2	−20 39.3	57	Markab	14 20.5	+14 58.6
19	108 17.0	39.8	8	Menkar	314 59.1	+ 3 55.4
20	123 16.8	40.3	36	Menkent	148 58.0	−36 09.4
21	138 16.6	·· 40.8	24	Miapl'dus	221 48.5	−69 32.2
22	153 16.4	41.3				
23	168 16.2	41.8	9	Mirfak	309 40.6	+49 42.7
			50	Nunki	76 51.1	−26 21.1
25 00	183 16.0	−20 42.3	52	Peacock	54 26.3	−56 52.6
01	198 15.8	42.7	21	Pollux	244 19.3	+28 07.7
02	213 15.7	43.2	20	Procyon	245 43.9	+ 5 20.1
03	228 15.5	·· 43.7				
04	243 15.3	44.2	46	R'alhague	96 46.2	+12 35.6
05	258 15.1	44.7	26	Regulus	208 28.6	+12 10.6
06	273 14.9	−20 45.2	11	Rigel	281 52.5	− 8 15.0
07	288 14.7	45.7	38	Rigil Kent.	140 50.4	−60 39.4
08	303 14.5	46.2	44	Sabik	103 01.6	−15 40.3
09	318 14.3	·· 46.7				
10	333 14.1	47.2	3	Schedar	350 28.6	+56 18.4
11	348 13.9	47.6	45	Shaula	97 19.9	−37 04.4
12	3 13.8	−20 48.1	18	Sirius	259 10.8	−16 39.3
13	18 13.6	48.6	33	Spica	159 16.2	−10 56.2
14	33 13.4	49.1	23	Suhail	223 23.5	−43 15.3
15	48 13.2	·· 49.6				
16	63 13.0	50.1	49	Vega	81 08.0	+38 44.8
17	78 12.8	50.5	39	Zub'g'bi	137 52.7	−15 51.7
18	93 12.6	−20 51.0				
19	108 12.4	51.5				
20	123 12.2	52.0				
21	138 12.0	·· 52.5				
22	153 11.8	52.9				
23	168 11.6	53.4				
24	183 11.4	−20 53.9				
code	—	− 5				

Lat. N °	Sunrise h m	Twlt. begins h m
72	▬	6 05
70	11 11	5 59
68	9 58	5 56
66	9 22	5 52
64	8 56	5 49
62	8 36	5 45
60	8 20	5 43
58	8 06	5 40
56	7 55	5 38
54	7 44	5 35
52	7 35	5 32
50	7 27	5 30
45	7 09	5 24
40	6 55	5 19
35	6 43	5 13
30	6 33	5 08
20	6 14	4 57
10	5 58	4 44
0	5 43	4 30
10	5 28	4 12
20	5 12	3 51
30	4 53	3 20
35	4 41	3 01
40	4 29	2 35
45	4 13	1 58
50	3 54	0 53
52	3 46	////
54	3 36	////
56	3 24	////
58	3 11	////
60	2 55	////
S		

Moonrise	23	24	25	26
	h m	h m	h m	h m
72	20 28	22 35	24 36	0 36
70	20 47	22 44	24 36	0 36
68	21 02	22 52	24 37	0 37
66	21 15	22 58	24 38	0 38
64	21 25	23 03	24 38	0 38
62	21 34	23 07	24 39	0 39
60	21 41	23 11	24 39	0 39
58	21 48	23 14	24 39	0 39
56	21 53	23 17	24 40	0 40
54	21 58	23 20	24 40	0 40
52	22 03	23 22	24 40	0 40
50	22 07	23 24	24 40	0 40
45	22 16	23 29	24 41	0 41
40	22 24	23 33	24 41	0 41
35	22 30	23 36	24 42	0 42
30	22 36	23 39	24 42	0 42
20	22 45	23 45	24 42	0 42
10	22 54	23 49	24 43	0 43
0	23 02	23 53	24 43	0 43
10	23 10	23 58	24 44	0 44
20	23 18	24 02	0 02	0 44
30	23 28	24 07	0 07	0 45
35	23 33	24 10	0 10	0 45
40	23 39	24 14	0 14	0 46
45	23 47	24 18	0 18	0 46
50	23 55	24 22	0 22	0 47
52	23 59	24 24	0 24	0 47
54	24 04	0 04	0 27	0 48
56	24 08	0 08	0 29	0 48
58	24 14	0 14	0 32	0 48
60	0 01	0 20	0 35	0 49

Lat. N °	Sunset h m	Twlt. ends h m
72	▬	17 25
70	12 22	17 32
68	13 35	17 35
66	14 11	17 38
64	14 37	17 42
62	14 57	17 46
60	15 13	17 48
58	15 27	17 52
56	15 39	17 54
54	15 49	17 57
52	15 58	17 59
50	16 06	18 01
45	16 24	18 08
40	16 38	18 13
35	16 50	18 19
30	17 01	18 25
20	17 19	18 36
10	17 35	18 49
0	17 50	19 04
10	18 06	19 22
20	18 22	19 44
30	18 41	20 14
35	18 53	20 35
40	19 06	21 01
45	19 21	21 37
50	19 40	22 45
52	19 49	////
54	19 59	////
56	20 11	////
58	20 24	////
60	20 40	////
S		

Moonset	23	24	25	26
	h m	h m	h m	h m
72	13 29	13 11	12 56	12 42
70	13 08	12 59	12 52	12 45
68	12 51	12 50	12 49	12 47
66	12 38	12 43	12 46	12 49
64	12 26	12 36	12 44	12 50
62	12 16	12 30	12 42	12 52
60	12 08	12 25	12 40	12 53
58	12 01	12 21	12 38	12 54
56	11 54	12 17	12 37	12 55
54	11 48	12 13	12 35	12 56
52	11 43	12 10	12 34	12 57
50	11 38	12 07	12 33	12 57
45	11 28	12 01	12 30	12 59
40	11 19	11 55	12 28	13 00
35	11 11	11 50	12 27	13 01
30	11 05	11 46	12 25	13 02
20	10 53	11 39	12 22	13 04
10	10 43	11 33	12 20	13 05
0	10 33	11 26	12 17	13 07
10	10 24	11 20	12 15	13 08
20	10 13	11 14	12 12	13 10
30	10 01	11 06	12 09	13 11
35	9 54	11 02	12 07	13 12
40	9 47	10 57	12 06	13 13
45	9 37	10 51	12 03	13 15
50	9 26	10 44	12 00	13 16
52	9 21	10 40	11 59	13 17
54	9 15	10 37	11 58	13 17
56	9 08	10 33	11 56	13 18
58	9 01	10 28	11 54	13 19
60	8 53	10 23	11 52	13 20

Equation of Time (App. − Mean)

GMT h	23 m s	24 m s	25 m s
0	+13 39.0	+13 22.1	+13 04.5
6	+13 34.8	+13 17.8	+13 00.0
12	+13 30.7	+13 13.4	+12 55.4
18	+13 26.4	+13 09.0	+12 50.8
24	+13 22.1	+13 04.5	+12 46.1

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
23	4 21	9 35	19 29	7 44	12 03
24	5 14	9 36	19 27	7 40	12 00
25	6 05	9 36	19 24	7 37	11 56
26	6 55	9 37	19 22	7 34	11 53

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.5	0.1	0.2
30	0.5	0.1	0.2
45	0.5	0.1	0.1
60	0.5	0.0	0.1
75	0.5	0.0	0.0
90			

Moon's Lower Limb Add

Alt. °	23 ′	24 ′	25 ′
0	18.7	18.3	18.0
4	18.7	18.3	18.0
8	18.7	18.3	17.9
12	18.7	18.3	17.9
16	18.6	18.2	17.9
20	18.6	18.2	17.8
24	18.5	18.1	17.8
28	18.4	18.1	17.7
32	18.3	18.0	17.6
36	18.2	17.9	17.6
40	18.1	17.8	17.5
44	18.0	17.7	17.4
48	17.8	17.6	17.3
52	17.7	17.4	17.2
56	17.6	17.3	17.1
60	17.4	17.2	17.0
64	17.2	17.0	16.8
68	17.1	16.9	16.7
72	16.9	16.8	16.6
76	16.8	16.6	16.5
80	16.6	16.5	16.3
84	16.4	16.3	16.2
88	16.3	16.2	16.1
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt. °	23 ′	24 ′	25 ′
0	13.7	14.0	14.2
4	13.7	14.0	14.2
8	13.8	14.0	14.2
12	13.8	14.0	14.2
16	13.9	14.1	14.3
20	13.9	14.1	14.3
24	14.0	14.2	14.4
28	14.1	14.2	14.4
32	14.2	14.3	14.5
36	14.3	14.4	14.6
40	14.4	14.5	14.7
44	14.5	14.6	14.7
48	14.6	14.7	14.8
52	14.8	14.9	15.0
56	14.9	15.0	15.1
60	15.1	15.1	15.2
64	15.2	15.3	15.3
68	15.4	15.4	15.4
72	15.5	15.5	15.5
76	15.7	15.7	15.7
80	15.9	15.8	15.8
84	16.1	16.0	15.9
88	16.2	16.1	16.0
90			

Subtract from table, back cover

Last Quarter 25

GMT	♈ GHA	VENUS −3.5 GHA	VENUS −3.5 Dec.	MARS −0.5 GHA	MARS −0.5 Dec.	JUPITER −1.5 GHA	JUPITER −1.5 Dec.	SATURN 0.6 GHA	SATURN 0.6 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
26 0	64 53.8	215 47.1	− 9 55.1	69 03.8	− 2 46.6	246 20.7	+ 1 52.6	181 21.2	−19 30.5	259 40.6	111	+ 0 50.0	−125
1	79 56.2	230 46.7	56.1	84 05.3	46.1	261 22.8	52.4	196 23.3	30.5	274 10.7	111	0 37.5	−126
2	94 58.7	245 46.2	57.2	99 06.8	45.5	276 24.9	52.3	211 25.5	30.6	288 40.8	112	0 24.9	−125
3	110 01.2	260 45.8	·· 58.3	114 08.3	·· 45.0	291 27.1	·· 52.2	226 27.6	·· 30.6	303 11.0	111	+ 0 12.4	−125
4	125 03.6	275 45.3	9 59.4	129 09.8	44.5	306 29.2	52.0	241 29.8	30.7	317 41.1	112	− 0 00.1	−125
5	140 06.1	290 44.8	10 00.4	144 11.3	43.9	321 31.4	51.9	256 31.9	30.7	332 11.3	112	0 12.6	−125
6	155 08.5	305 44.4	−10 01.5	159 12.7	− 2 43.4	336 33.5	+ 1 51.8	271 34.1	−19 30.8	346 41.5	113	− 0 25.1	−125
7	170 11.0	320 43.9	02.6	174 14.2	42.8	351 35.6	51.6	286 36.3	30.8	1 11.8	112	0 37.6	−125
8	185 13.5	335 43.5	03.7	189 15.7	42.3	6 37.8	51.5	301 38.4	30.9	15 42.0	112	0 50.1	−125
9	200 15.9	350 43.0	·· 04.7	204 17.2	·· 41.7	21 39.9	·· 51.4	316 40.6	·· 30.9	30 12.2	113	· 1 02.6	−124
10	215 18.4	5 42.6	05.8	219 18.7	41.2	36 42.1	51.2	331 42.7	31.0	44 42.5	113	1 15.0	−125
11	230 20.9	20 42.1	06.9	234 20.2	40.7	51 44.2	51.1	346 44.9	31.1	59 12.8	113	1 27.5	−124
12	245 23.3	35 41.6	−10 08.0	249 21.6	− 2 40.1	66 46.3	+ 1 51.0	1 47.0	−19 31.1	73 43.1	113	− 1 39.9	−124
13	260 25.8	50 41.2	09.0	264 23.1	39.6	81 48.5	50.8	16 49.2	31.2	88 13.4	113	1 52.3	−124
14	275 28.3	65 40.7	10.1	279 24.6	39.0	96 50.6	50.7	31 51.3	31.2	102 43.7	113	2 04.7	−124
15	290 30.7	80 40.3	·· 11.2	294 26.1	·· 38.5	111 52.8	·· 50.6	46 53.5	·· 31.3	117 14.0	113	· 2 17.1	−123
16	305 33.2	95 39.8	12.3	309 27.6	37.9	126 54.9	50.5	61 55.6	31.3	131 44.3	114	2 29.4	−124
17	320 35.7	110 39.3	13.3	324 29.0	37.4	141 57.0	50.3	76 57.8	31.4	146 14.7	113	2 41.8	−123
18	335 38.1	125 38.9	−10 14.4	339 30.5	− 2 36.9	156 59.2	+ 1 50.2	92 00.0	−19 31.4	160 45.0	114	− 2 54.1	−123
19	350 40.6	140 38.4	15.5	354 32.0	36.3	172 01.3	50.1	107 02.1	31.5	175 15.4	113	3 06.4	−123
20	5 43.0	155 37.9	16.5	9 33.5	35.8	187 03.5	49.9	122 04.3	31.5	189 45.7	114	3 18.7	−122
21	20 45.5	170 37.5	·· 17.6	24 34.9	·· 35.2	202 05.6	·· 49.8	137 06.4	·· 31.6	204 16.1	113	· 3 30.9	−123
22	35 48.0	185 37.0	18.7	39 36.4	34.7	217 07.8	49.7	152 08.6	31.7	218 46.4	114	3 43.2	−121
23	50 50.4	200 36.6	19.7	54 37.9	34.1	232 09.9	49.6	167 10.7	31.7	233 16.8	114	3 55.3	−122
27 0	65 52.9	215 36.1	−10 20.8	69 39.4	− 2 33.6	247 12.0	+ 1 49.4	182 12.9	−19 31.8	247 47.2	113	− 4 07.5	−122
1	80 55.4	230 35.6	21.9	84 40.8	33.1	262 14.2	49.3	197 15.0	31.8	262 17.5	114	4 19.7	−121
2	95 57.8	245 35.2	22.9	99 42.3	32.5	277 16.3	49.2	212 17.2	31.9	276 47.9	114	4 31.8	−121
3	111 00.3	260 34.7	·· 24.0	114 43.8	·· 32.0	292 18.5	·· 49.0	227 19.3	·· 31.9	291 18.3	114	· 4 43.9	−120
4	126 02.8	275 34.2	25.1	129 45.3	31.4	307 20.6	48.9	242 21.5	32.0	305 48.7	113	4 55.9	−120
5	141 05.2	290 33.8	26.1	144 46.7	30.9	322 22.8	48.8	257 23.7	32.0	320 19.0	114	5 07.9	−120
6	156 07.7	305 33.3	−10 27.2	159 48.2	− 2 30.3	337 24.9	+ 1 48.6	272 25.8	−19 32.1	334 49.4	114	− 5 19.9	−120
7	171 10.1	320 32.8	28.3	174 49.7	29.8	352 27.1	48.5	287 28.0	32.1	349 19.8	113	5 31.9	−119
8	186 12.6	335 32.4	29.3	189 51.1	29.2	7 29.2	48.4	302 30.1	32.2	3 50.1	114	5 43.8	−119
9	201 15.1	350 31.9	·· 30.4	204 52.6	·· 28.7	22 31.3	·· 48.3	317 32.3	·· 32.2	18 20.5	113	· 5 55.7	−118
10	216 17.5	5 31.4	31.5	219 54.1	28.1	37 33.5	48.1	332 34.4	32.3	32 50.8	114	6 07.5	−118
11	231 20.0	20 31.0	32.5	234 55.5	27.6	52 35.6	48.0	347 36.6	32.4	47 21.2	113	6 19.3	−118
12	246 22.5	35 30.5	−10 33.6	249 57.0	− 2 27.1	67 37.8	+ 1 47.9	2 38.7	−19 32.4	61 51.5	114	− 6 31.1	−117
13	261 24.9	50 30.0	34.7	264 58.5	26.5	82 39.9	47.7	17 40.9	32.5	76 21.9	113	6 42.8	−117
14	276 27.4	65 29.6	35.7	280 00.0	26.0	97 42.1	47.6	32 43.0	32.5	90 52.2	113	6 54.5	−116
15	291 29.9	80 29.1	·· 36.8	295 01.4	·· 25.4	112 44.2	·· 47.5	47 45.2	·· 32.6	105 22.5	113	· 7 06.1	−116
16	306 32.3	95 28.6	37.9	310 02.9	24.9	127 46.4	47.4	62 47.4	32.6	119 52.8	113	7 17.7	−116
17	321 34.8	110 28.1	38.9	325 04.3	24.3	142 48.5	47.2	77 49.5	32.7	134 23.1	113	7 29.3	−115
18	336 37.3	125 27.7	−10 40.0	340 05.8	− 2 23.8	157 50.7	+ 1 47.1	92 51.7	−19 32.7	148 53.4	113	− 7 40.8	−114
19	351 39.7	140 27.2	41.0	355 07.3	23.2	172 52.8	47.0	107 53.8	32.8	163 23.7	113	7 52.2	−115
20	6 42.2	155 26.7	42.1	10 08.7	22.7	187 55.0	46.9	122 56.0	32.8	177 54.0	112	8 03.7	−113
21	21 44.6	170 26.3	·· 43.2	25 10.2	·· 22.1	202 57.1	·· 46.7	137 58.1	·· 32.9	192 24.2	113	· 8 15.0	−113
22	36 47.1	185 25.8	44.2	40 11.7	21.6	217 59.2	46.6	153 00.3	33.0	206 54.5	112	8 26.3	−113
23	51 49.6	200 25.3	45.3	55 13.1	21.0	233 01.4	46.5	168 02.4	33.0	221 24.7	112	8 37.6	−112
28 0	66 52.0	215 24.8	−10 46.3	70 14.6	− 2 20.5	248 03.5	+ 1 46.3	183 04.6	−19 33.1	235 54.9	112	− 8 48.8	−112
1	81 54.5	230 24.4	47.4	85 16.1	19.9	263 05.7	46.2	198 06.7	33.1	250 25.1	112	9 00.0	−111
2	96 57.0	245 23.9	48.5	100 17.5	19.4	278 07.8	46.1	213 08.9	33.2	264 55.3	112	9 11.1	−110
3	111 59.4	260 23.4	·· 49.5	115 19.0	·· 18.8	293 10.0	·· 46.0	228 11.1	·· 33.2	279 25.5	112	· 9 22.1	−110
4	127 01.9	275 22.9	50.6	130 20.4	18.3	308 12.1	45.8	243 13.2	33.3	293 55.7	111	9 33.1	−110
5	142 04.4	290 22.5	51.6	145 21.9	17.7	323 14.3	45.7	258 15.4	33.3	308 25.8	111	9 44.1	−109
6	157 06.8	305 22.0	−10 52.7	160 23.4	− 2 17.2	338 16.4	+ 1 45.6	273 17.5	−19 33.4	322 55.9	111	− 9 55.0	−108
7	172 09.3	320 21.5	53.8	175 24.8	16.7	353 18.6	45.5	288 19.7	33.4	337 26.0	111	10 05.8	−108
8	187 11.8	335 21.0	54.8	190 26.3	16.1	8 20.7	45.3	303 21.8	33.5	351 56.1	111	10 16.6	−107
9	202 14.2	350 20.6	·· 55.9	205 27.7	·· 15.6	23 22.9	·· 45.2	318 24.0	·· 33.5	6 26.2	111	·10 27.3	−106
10	217 16.7	5 20.1	56.9	220 29.2	15.0	38 25.0	45.1	333 26.1	33.6	20 56.3	110	10 37.9	−106
11	232 19.1	20 19.6	58.0	235 30.6	14.5	53 27.2	45.0	348 28.3	33.7	35 26.3	110	10 48.5	−105
12	247 21.6	35 19.1	−10 59.0	250 32.1	− 2 13.9	68 29.3	+ 1 44.8	3 30.5	−19 33.7	49 56.3	110	−10 59.0	−105
13	262 24.1	50 18.6	11 00.1	265 33.6	13.4	83 31.5	44.7	18 32.6	33.8	64 26.3	110	11 09.5	−104
14	277 26.5	65 18.2	01.1	280 35.0	12.8	98 33.6	44.6	33 34.8	33.8	78 56.3	110	11 19.9	−103
15	292 29.0	80 17.7	·· 02.2	295 36.5	·· 12.3	113 35.8	·· 44.4	48 36.9	·· 33.9	93 26.3	109	·11 30.2	−103
16	307 31.5	95 17.2	03.2	310 37.9	11.7	128 37.9	44.3	63 39.1	33.9	107 56.2	109	11 40.5	−102
17	322 33.9	110 16.7	04.3	325 39.4	11.2	143 40.1	44.2	78 41.2	34.0	122 26.1	109	11 50.7	−101
18	337 36.4	125 16.2	−11 05.4	340 40.8	− 2 10.6	158 42.2	+ 1 44.1	93 43.4	−19 34.0	136 56.0	109	−12 00.8	−101
19	352 38.9	140 15.8	06.4	355 42.3	10.1	173 44.4	43.9	108 45.5	34.1	151 25.9	109	12 10.9	−100
20	7 41.3	155 15.3	07.5	10 43.7	09.5	188 46.5	43.8	123 47.7	34.1	165 55.8	108	12 20.9	− 99
21	22 43.8	170 14.8	·· 08.5	25 45.2	·· 08.9	203 48.7	·· 43.7	138 49.8	·· 34.2	180 25.6	108	·12 30.8	− 98
22	37 46.3	185 14.3	09.6	40 46.6	08.4	218 50.9	43.6	153 52.0	34.2	194 55.4	108	12 40.6	− 98
23	52 48.7	200 13.8	10.6	55 48.1	07.8	233 53.0	43.4	168 54.1	34.3	209 25.2	108	12 50.4	− 97
24	67 51.2	215 13.3	−11 11.7	70 49.5	− 2 07.3	248 55.2	+ 1 43.3	183 56.3	−19 34.4	223 55.0	107	−13 00.1	− 97
code	−	− 5	− 11	+ 15	+ 6	+ 21	− 2	+ 22	− 1				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
26 0	183 11.4	−20 53.9	7	Acamar	315 50.1	−40 28.6
1	198 11.2	54.4	5	Achernar	335 57.8	−57 27.4
2	213 11.0	54.8	30	Acrux	173 57.1	−62 51.4
3	228 10.8	·· 55.3	19	Adhara	255 45.6	−28 54.7
4	243 10.6	55.8	10	Aldebaran	291 37.7	+16 25.5
5	258 10.4	56.3				
6	273 10.2	−20 56.7	32	Alioth	166 58.2	+56 11.3
7	288 10.0	57.2	34	Alkaid	153 32.7	+49 31.5
8	303 09.8	57.7	55	Al Na'ir	28 37.0	−47 10.3
9	318 09.6	·· 58.2	15	Alnilam	276 29.1	− 1 13.7
10	333 09.4	58.6	25	Alphard	218 37.7	− 8 28.3
11	348 09.2	59.1				
12	3 09.0	−20 59.6	41	Alphecca	126 47.3	+26 51.6
13	18 08.8	21 00.0	1	Alpheratz	358 27.3	+28 51.4
14	33 08.6	00.5	51	Altair	62 49.8	+ 8 45.4
15	48 08.4	·· 01.0	2	Ankaa	353 57.3	−42 32.5
16	63 08.2	01.4	42	Antares	113 18.7	−26 20.2
17	78 08.0	01.9				
18	93 07.8	−21 02.4	37	Arcturus	146 34.7	+19 24.3
19	108 07.6	02.8	43	Atria	108 59.2	−68 57.0
20	123 07.4	03.3	22	Avior	234 35.0	−59 22.1
21	138 07.2	·· 03.8	13	Bellatrix	279 17.2	+ 6 18.7
22	153 07.0	04.2	16	Betelg'se	271 46.9	+ 7 24.0
23	168 06.8	04.7				
			17	Canopus	264 14.5	−52 40.2
27 0	183 06.6	−21 05.2	12	Capella	281 36.7	+45 57.3
1	198 06.4	05.6	53	Deneb	50 00.6	+45 07.9
2	213 06.2	06.1	28	Denebola	183 17.0	+14 48.7
3	228 06.0	·· 06.5	4	Diphda	349 38.2	−18 13.3
4	243 05.8	07.0				
5	258 05.6	07.4	27	Dubhe	194 43.7	+61 58.7
6	273 05.4	−21 07.9	14	Elnath	279 05.9	+28 34.3
7	288 05.2	08.4	47	Eltanin	91 06.4	+51 29.8
8	303 05.0	08.8	54	Enif	34 28.8	+ 9 40.8
9	318 04.8	·· 09.3	56	Fomalhaut	16 10.7	−29 51.1
10	333 04.6	09.7				
11	348 04.4	10.2	31	Gacrux	172 48.5	−56 52.1
12	3 04.2	−21 10.6	29	Gienah	176 36.1	−17 18.1
13	18 04.0	11.1	35	Hadar	149 48.7	−60 09.8
14	33 03.7	11.5	6	Hamal	328 48.4	+23 15.7
15	48 03.5	·· 12.0	48	Kaus Aust.	84 40.4	−34 24.4
16	63 03.3	12.4				
17	78 03.1	12.9	40	Kochab	137 19.3	+74 19.8
18	93 02.9	−21 13.3	57	Markab	14 20.5	+14 58.6
19	108 02.7	13.8	8	Menkar	314 59.1	+ 3 55.4
20	123 02.5	14.2	36	Menkent	148 58.0	−36 09.4
21	138 02.3	·· 14.7	24	Miapl'dus	221 48.4	−69 32.2
22	153 02.1	15.1				
23	168 01.9	15.6	9	Mirfak	309 40.6	+49 42.7
			50	Nunki	76 51.2	−26 21.1
28 0	183 01.6	−21 16.0	52	Peacock	54 26.3	−56 52.6
1	198 01.4	16.5	21	Pollux	244 19.3	+28 07.7
2	213 01.2	16.9	20	Procyon	245 43.9	+ 5 20.1
3	228 01.0	·· 17.3				
4	243 00.8	17.8	46	R'alhague	96 46.2	+12 35.6
5	258 00.6	18.2	26	Regulus	208 28.6	+12 10.6
6	273 00.4	−21 18.7	11	Rigel	281 52.5	− 8 15.0
7	288 00.2	19.1	38	Rigil Kent.	140 50.3	−60 39.4
8	302 59.9	19.5	44	Sabik	103 01.5	−15 40.3
9	317 59.7	·· 20.0				
10	332 59.5	20.4	3	Schedar	350 28.6	+56 18.4
11	347 59.3	20.9	45	Shaula	97 19.9	−37 04.4
12	2 59.1	−21 21.3	18	Sirius	259 10.8	−16 39.3
13	17 58.9	21.7	33	Spica	159 16.2	−10 56.2
14	32 58.7	22.2	23	Suhail	223 23.5	−43 15.3
15	47 58.4	·· 22.6				
16	62 58.2	23.0	49	Vega	81 08.0	+38 44.8
17	77 58.0	23.5	39	Zub'g'bi	137 52.7	−15 51.7
18	92 57.8	−21 23.9				
19	107 57.6	24.3				
20	122 57.4	24.8				
21	137 57.1	·· 25.2				
22	152 56.9	25.6				
23	167 56.7	26.0				
24	182 56.5	−21 26.5				
code	—	− 5				

Lat.	Sunrise	Twlt. begins	Moonrise 26	27	28	29
N °	h m	h m	h m	h m	h m	h m
72	▬	6 13	0 36	2 34	4 34	6 42
70	▬	6 07	0 36	2 27	4 18	6 11
68	10 14	6 02	0 37	2 21	4 05	5 49
66	9 33	5 58	0 38	2 16	3 54	5 32
64	9 05	5 55	0 38	2 12	3 46	5 18
62	8 44	5 51	0 39	2 09	3 38	5 06
60	8 27	5 47	0 39	2 06	3 32	4 56
58	8 12	5 44	0 39	2 03	3 26	4 47
56	8 00	5 42	0 40	2 01	3 21	4 40
54	7 49	5 40	0 40	1 59	3 17	4 33
52	7 40	5 36	0 40	1 57	3 13	4 27
50	7 31	5 34	0 40	1 55	3 09	4 22
45	7 13	5 28	0 41	1 51	3 01	4 10
40	6 59	5 21	0 41	1 48	2 55	4 00
35	6 46	5 16	0 42	1 46	2 49	3 52
30	6 35	5 10	0 42	1 43	2 44	3 45
20	6 16	4 59	0 42	1 39	2 36	3 32
10	6 00	4 45	0 43	1 36	2 28	3 21
0	5 44	4 30	0 43	1 33	2 22	3 11
10	5 28	4 12	0 44	1 29	2 15	3 01
20	5 11	3 49	0 44	1 26	2 08	2 51
30	4 52	3 19	0 45	1 22	1 59	2 39
35	4 40	2 59	0 45	1 20	1 55	2 32
40	4 27	2 31	0 46	1 17	1 50	2 24
45	4 11	1 54	0 46	1 15	1 43	2 15
50	3 52	0 39	0 47	1 11	1 36	2 04
52	3 42	////	0 47	1 10	1 33	1 59
54	3 32	////	0 48	1 08	1 29	1 53
56	3 20	////	0 48	1 06	1 25	1 47
58	3 06	////	0 48	1 04	1 21	1 40
60	2 50	////	0 49	1 02	1 16	1 32
S						

Lat.	Sunset	Twlt. ends	Moonset 26	27	28	29
N °	h m	h m	h m	h m	h m	h m
72	▬	17 19	12 42	12 28	12 11	11 47
70	▬	17 25	12 45	12 38	12 29	12 19
68	13 21	17 30	12 47	12 45	12 44	12 43
66	14 02	17 34	12 49	12 52	12 56	13 01
64	14 30	17 39	12 50	12 57	13 06	13 16
62	14 51	17 42	12 52	13 02	13 14	13 29
60	15 08	17 45	12 53	13 06	13 21	13 40
58	15 23	17 49	12 54	13 10	13 28	13 49
56	15 35	17 52	12 55	13 14	13 34	13 57
54	15 46	17 55	12 56	13 17	13 39	14 04
52	15 55	17 57	12 57	13 19	13 44	14 11
50	16 04	18 00	12 57	13 22	13 48	14 17
45	16 22	18 06	12 59	13 27	13 57	14 30
40	16 37	18 13	13 00	13 32	14 05	14 41
35	16 49	18 18	13 01	13 36	14 12	14 50
30	17 00	18 24	13 02	13 39	14 18	14 58
20	17 19	18 37	13 04	13 45	14 28	15 12
10	17 36	18 50	13 05	13 51	14 37	15 24
0	17 51	19 05	13 07	13 56	14 45	15 35
10	18 07	19 23	13 08	14 01	14 54	15 47
20	18 24	19 46	13 10	14 06	15 03	15 59
30	18 44	20 17	13 11	14 13	15 13	16 13
35	18 55	20 38	13 12	14 16	15 19	16 22
40	19 09	21 05	13 13	14 20	15 26	16 31
45	19 25	21 44	13 15	14 25	15 34	16 42
50	19 44	23 01	13 16	14 30	15 44	16 55
52	19 54	////	13 17	14 33	15 48	17 01
54	20 04	////	13 17	14 36	15 53	17 08
56	20 16	////	13 18	14 39	15 58	17 16
58	20 30	////	13 19	14 43	16 05	17 25
60	20 47	////	13 20	14 47	16 12	17 35
S						

GMT	Equation of Time (App. − Mean) 26	27	28
h	m s	m s	m s
0	+12 46.1	+12 26.9	+12 07.0
6	+12 41.4	+12 22.0	+12 01.9
12	+12 36.6	+12 17.0	+11 56.8
18	+12 31.8	+12 12.0	+11 51.6
24	+12 26.9	+12 07.0	+11 46.3

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
26	6 55	9 37	19 22	7 34	11 53
27	7 44	9 38	19 20	7 30	11 49
28	8 33	9 39	19 17	7 27	11 46
29	9 23	9 39	19 15	7 23	11 43

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb **Add**	Venus **Add**	Mars **Add**
°	′	′	′
0	0.5	0.1	0.2
30	0.5	0.1	0.2
45	0.5	0.1	0.1
60	0.5	0.0	0.1
75	0.5	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	26	27	28
°	′	′	′
0	17.5	16.8	16.3
4	17.5	16.8	16.3
8	17.4	16.8	16.3
12	17.4	16.8	16.3
16	17.4	16.8	16.3
20	17.4	16.8	16.3
24	17.3	16.7	16.3
28	17.3	16.7	16.2
32	17.2	16.7	16.2
36	17.1	16.6	16.2
40	17.1	16.6	16.2
44	17.0	16.5	16.1
48	16.9	16.5	16.1
52	16.8	16.4	16.1
56	16.8	16.4	16.0
60	16.7	16.3	16.0
64	16.6	16.2	16.0
68	16.5	16.2	15.9
72	16.4	16.1	15.9
76	16.3	16.0	15.8
80	16.2	16.0	15.8
84	16.1	15.9	15.8
88	16.0	15.8	15.7
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	26	27	28
°	′	′	′
0	14.5	14.8	15.1
4	14.5	14.8	15.1
8	14.5	14.8	15.1
12	14.5	14.9	15.1
16	14.5	14.9	15.1
20	14.6	14.9	15.2
24	14.6	14.9	15.2
28	14.7	15.0	15.2
32	14.7	15.0	15.2
36	14.8	15.0	15.2
40	14.8	15.1	15.3
44	14.9	15.1	15.3
48	15.0	15.2	15.3
52	15.1	15.2	15.4
56	15.2	15.3	15.4
60	15.3	15.4	15.4
64	15.3	15.4	15.5
68	15.4	15.5	15.5
72	15.5	15.5	15.5
76	15.6	15.6	15.6
80	15.8	15.7	15.6
84	15.9	15.8	15.7
88	15.9	15.8	15.7
90			

Subtract from table, back cover

G M T	♈ GHA	VENUS −3.4 GHA	Dec.	MARS −0.4 GHA	Dec.	JUPITER −1.5 GHA	Dec.	SATURN 0.6 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
29 0	67 51.2	215 13.3	−11 11.7	70 49.5	− 2 07.3	248 55.2	+ 1 43.3	183 56.3	−19 34.4	223 55.0	107	−13 00.1	− 97
1	82 53.6	230 12.9	12.7	85 51.0	06.7	263 57.3	43.2	198 58.5	34.4	238 24.7	108	13 09.8	− 95
2	97 56.1	245 12.4	13.8	100 52.4	06.2	278 59.5	43.1	214 00.6	34.5	252 54.5	107	13 19.3	− 95
3	112 58.6	260 11.9	·· 14.8	115 53.9	·· 05.6	294 01.6	·· 42.9	229 02.8	·· 34.5	267 24.2	106	·13 28.8	− 94
4	128 01.0	275 11.4	15.9	130 55.3	05.1	309 03.8	42.8	244 04.9	34.6	281 53.8	107	13 38.2	− 93
5	143 03.5	290 10.9	16.9	145 56.8	04.5	324 05.9	42.7	259 07.1	34.6	296 23.5	106	13 47.5	− 93
6	158 06.0	305 10.4	−11 18.0	160 58.2	− 2 04.0	339 08.1	+ 1 42.6	274 09.2	−19 34.7	310 53.1	106	−13 56.8	− 91
7	173 08.4	320 09.9	19.0	175 59.7	03.4	354 10.2	42.4	289 11.4	34.7	325 22.7	106	14 05.9	− 91
8	188 10.9	335 09.5	20.0	191 01.1	02.9	9 12.4	42.3	304 13.5	34.8	339 52.3	106	14 15.0	− 90
9	203 13.4	350 09.0	·· 21.1	206 02.6	·· 02.3	24 14.5	·· 42.2	319 15.7	·· 34.8	354 21.9	105	·14 24.0	− 90
10	218 15.8	5 08.5	22.1	221 04.0	01.8	39 16.7	42.1	334 17.8	34.9	8 51.4	105	14 33.0	− 88
11	233 18.3	20 08.0	23.2	236 05.4	01.2	54 18.9	42.0	349 20.0	34.9	23 20.9	105	14 41.8	− 88
12	248 20.7	35 07.5	−11 24.2	251 06.9	− 2 00.7	69 21.0	+ 1 41.8	4 22.2	−19 35.0	37 50.4	105	−14 50.6	− 86
13	263 23.2	50 07.0	25.3	266 08.3	2 00.1	84 23.2	41.7	19 24.3	35.1	52 19.9	104	14 59.2	− 86
14	278 25.7	65 06.5	26.3	281 09.8	1 59.6	99 25.3	41.6	34 26.5	35.1	66 49.3	104	15 07.8	− 85
15	293 28.1	80 06.0	·· 27.4	296 11.2	·· 59.0	114 27.5	·· 41.5	49 28.6	·· 35.2	81 18.7	104	·15 16.3	− 85
16	308 30.6	95 05.5	28.4	311 12.7	58.4	129 29.6	41.3	64 30.8	35.2	95 48.1	104	15 24.8	− 83
17	323 33.1	110 05.1	29.5	326 14.1	57.9	144 31.8	41.2	79 32.9	35.3	110 17.5	104	15 33.1	− 82
18	338 35.5	125 04.6	−11 30.5	341 15.5	− 1 57.3	159 33.9	+ 1 41.1	94 35.1	−19 35.3	124 46.9	103	−15 41.3	− 82
19	353 38.0	140 04.1	31.5	356 17.0	56.8	174 36.1	41.0	109 37.2	35.4	139 16.2	103	15 49.5	− 81
20	8 40.5	155 03.6	32.6	11 18.4	56.2	189 38.3	40.8	124 39.4	35.4	153 45.5	103	15 57.6	− 80
21	23 42.9	170 03.1	·· 33.6	26 19.9	·· 55.7	204 40.4	·· 40.7	139 41.5	·· 35.5	168 14.8	102	·16 05.6	− 78
22	38 45.4	185 02.6	34.7	41 21.3	55.1	219 42.6	40.6	154 43.7	35.5	182 44.0	103	16 13.4	− 78
23	53 47.9	200 02.1	35.7	56 22.7	54.6	234 44.7	40.5	169 45.9	35.6	197 13.3	102	16 21.2	− 77
30 0	68 50.3	215 01.6	−11 36.7	71 24.2	− 1 54.0	249 46.9	+ 1 40.4	184 48.0	−19 35.6	211 42.5	101	−16 28.9	− 77
1	83 52.8	230 01.1	37.8	86 25.6	53.5	264 49.0	40.2	199 50.2	35.7	226 11.6	102	16 36.6	− 75
2	98 55.2	245 00.6	38.8	101 27.1	52.9	279 51.2	40.1	214 52.3	35.7	240 40.8	102	16 44.1	− 74
3	113 57.7	260 00.1	·· 39.9	116 28.5	·· 52.3	294 53.4	·· 40.0	229 54.5	·· 35.8	255 10.0	101	·16 51.5	− 73
4	129 00.2	274 59.6	40.9	131 29.9	51.8	309 55.5	39.9	244 56.6	35.9	269 39.1	101	16 58.8	− 73
5	144 02.6	289 59.1	41.9	146 31.4	51.2	324 57.7	39.7	259 58.8	35.9	284 08.2	101	17 06.1	− 71
6	159 05.1	304 58.6	−11 43.0	161 32.8	− 1 50.7	339 59.8	+ 1 39.6	275 00.9	−19 36.0	298 37.3	100	−17 13.2	− 71
7	174 07.6	319 58.1	44.0	176 34.2	50.1	355 02.0	39.5	290 03.1	36.0	313 06.3	100	17 20.3	− 69
8	189 10.0	334 57.6	45.1	191 35.7	49.6	10 04.2	39.4	305 05.2	36.1	327 35.3	101	17 27.2	− 69
9	204 12.5	349 57.1	·· 46.1	206 37.1	·· 49.0	25 06.3	·· 39.2	320 07.4	·· 36.1	342 04.4	100	·17 34.1	− 67
10	219 15.0	4 56.6	47.1	221 38.5	48.5	40 08.5	39.1	335 09.5	36.2	356 33.4	99	17 40.8	− 67
11	234 17.4	19 56.1	48.2	236 40.0	47.9	55 10.6	39.0	350 11.7	36.2	11 02.3	100	17 47.5	− 65
12	249 19.9	34 55.6	−11 49.2	251 41.4	− 1 47.3	70 12.8	+ 1 38.9	5 13.9	−19 36.3	25 31.3	99	−17 54.0	− 65
13	264 22.4	49 55.1	50.2	266 42.8	46.8	85 15.0	38.8	20 16.0	36.3	40 00.2	100	18 00.5	− 64
14	279 24.8	64 54.6	51.3	281 44.3	46.2	100 17.1	38.6	35 18.2	36.4	54 29.2	99	18 06.9	− 62
15	294 27.3	79 54.1	·· 52.3	296 45.7	·· 45.7	115 19.3	·· 38.5	50 20.3	·· 36.4	68 58.1	99	·18 13.1	− 62
16	309 29.7	94 53.6	53.3	311 47.1	45.1	130 21.4	38.4	65 22.5	36.5	83 27.0	98	18 19.3	− 60
17	324 32.2	109 53.1	54.4	326 48.5	44.6	145 23.6	38.3	80 24.6	36.5	97 55.8	99	18 25.3	− 60
18	339 34.7	124 52.6	−11 55.4	341 50.0	− 1 44.0	160 25.8	+ 1 38.2	95 26.8	−19 36.6	112 24.7	98	−18 31.3	− 58
19	354 37.1	139 52.1	56.4	356 51.4	43.4	175 27.9	38.0	110 28.9	36.6	126 53.5	98	18 37.1	− 58
20	9 39.6	154 51.6	57.5	11 52.8	42.9	190 30.1	37.9	125 31.1	36.7	141 22.3	98	18 42.9	− 56
21	24 42.1	169 51.1	·· 58.5	26 54.3	·· 42.3	205 32.2	·· 37.8	140 33.2	·· 36.8	155 51.1	98	·18 48.5	− 55
22	39 44.5	184 50.6	11 59.5	41 55.7	41.8	220 34.4	37.7	155 35.4	36.8	170 19.9	98	18 54.0	− 55
23	54 47.0	199 50.1	12 00.6	56 57.1	41.2	235 36.6	37.6	170 37.6	36.9	184 48.7	98	18 59.5	− 53
1 0	69 49.5	214 49.6	−12 01.6	71 58.5	− 1 40.7	250 38.7	+ 1 37.4	185 39.7	−19 36.9	199 17.5	97	−19 04.8	− 52
1	84 51.9	229 49.1	02.6	87 00.0	40.1	265 40.9	37.3	200 41.9	37.0	213 46.2	98	19 10.0	− 51
2	99 54.4	244 48.6	03.6	102 01.4	39.5	280 43.1	37.2	215 44.0	37.0	228 15.0	97	19 15.1	− 50
3	114 56.8	259 48.1	·· 04.7	117 02.8	·· 39.0	295 45.2	·· 37.1	230 46.2	·· 37.1	242 43.7	97	·19 20.1	− 49
4	129 59.3	274 47.6	05.7	132 04.2	38.4	310 47.4	37.0	245 48.3	37.1	257 12.4	97	19 25.0	− 48
5	145 01.8	289 47.1	06.7	147 05.7	37.9	325 49.5	36.8	260 50.5	37.2	271 41.1	97	19 29.8	− 47
6	160 04.2	304 46.6	−12 07.8	162 07.1	− 1 37.3	340 51.7	+ 1 36.7	275 52.6	−19 37.2	286 09.8	97	−19 34.5	− 46
7	175 06.7	319 46.1	08.8	177 08.5	36.7	355 53.9	36.6	290 54.8	37.3	300 38.5	97	19 39.1	− 44
8	190 09.2	334 45.6	09.8	192 09.9	36.2	10 56.0	36.5	305 56.9	37.3	315 07.2	97	19 43.5	− 44
9	205 11.6	349 45.0	·· 10.8	207 11.4	·· 35.6	25 58.2	·· 36.4	320 59.1	·· 37.4	329 35.9	96	·19 47.9	− 43
10	220 14.1	4 44.5	11.9	222 12.8	35.1	41 00.4	36.2	336 01.3	37.4	344 04.5	97	19 52.2	− 41
11	235 16.6	19 44.0	12.9	237 14.2	34.5	56 02.5	36.1	351 03.4	37.5	358 33.2	97	19 56.3	− 40
12	250 19.0	34 43.5	−12 13.9	252 15.6	− 1 33.9	71 04.7	+ 1 36.0	6 05.6	−19 37.5	13 01.9	96	−20 00.3	− 40
13	265 21.5	49 43.0	14.9	267 17.0	33.4	86 06.9	35.9	21 07.7	37.6	27 30.5	97	20 04.3	− 38
14	280 24.0	64 42.5	16.0	282 18.5	32.8	101 09.0	35.8	36 09.9	37.7	41 59.2	96	20 08.1	− 37
15	295 26.4	79 42.0	·· 17.0	297 19.9	·· 32.3	116 11.2	·· 35.6	51 12.0	·· 37.7	56 27.8	96	·20 11.8	− 36
16	310 28.9	94 41.5	18.0	312 21.3	31.7	131 13.4	35.5	66 14.2	37.8	70 56.4	97	20 15.4	− 34
17	325 31.3	109 41.0	19.0	327 22.7	31.1	146 15.5	35.4	81 16.3	37.8	85 25.1	96	20 18.8	− 34
18	340 33.8	124 40.5	−12 20.0	342 24.1	− 1 30.6	161 17.7	+ 1 35.3	96 18.5	−19 37.9	99 53.7	97	−20 22.2	− 33
19	355 36.3	139 39.9	21.1	357 25.5	30.0	176 19.9	35.2	111 20.6	37.9	114 22.4	96	20 25.5	− 31
20	10 38.7	154 39.4	22.1	12 27.0	29.5	191 22.0	35.0	126 22.8	38.0	128 51.0	96	20 28.6	− 31
21	25 41.2	169 38.9	·· 23.1	27 28.4	·· 28.9	206 24.2	·· 34.9	141 25.0	·· 38.0	143 19.6	97	·20 31.7	− 29
22	40 43.7	184 38.4	24.1	42 29.8	28.3	221 26.4	34.8	156 27.1	38.1	157 48.3	96	20 34.6	− 28
23	55 46.1	199 37.9	25.1	57 31.2	27.8	236 28.5	34.7	171 29.3	38.1	172 16.9	97	20 37.4	− 27
24	70 48.6	214 37.4	−12 26.2	72 32.6	− 1 27.2	251 30.7	+ 1 34.6	186 31.4	−19 38.2	186 45.6	96	−20 40.1	− 26
corr	·	− 5	− 10	+ 14	+ 5	+ 22	− 1	+ 21	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
29 0	182 56.5	−21 26.5
1	197 56.3	26.9
2	212 56.0	27.3
3	227 55.8	27.7
4	242 55.6	28.2
5	257 55.4	28.6
6	272 55.2	−21 29.0
7	287 54.9	29.4
8	302 54.7	29.9
9	317 54.5	30.3
10	332 54.3	30.7
11	347 54.0	31.1
12	2 53.8	−21 31.5
13	17 53.6	32.0
14	32 53.4	32.4
15	47 53.2	32.8
16	62 52.9	33.2
17	77 52.7	33.6
18	92 52.5	−21 34.0
19	107 52.3	34.5
20	122 52.0	34.9
21	137 51.8	35.3
22	152 51.6	35.7
23	167 51.4	36.1
30 0	182 51.1	−21 36.5
1	197 50.9	36.9
2	212 50.7	37.3
3	227 50.5	37.7
4	242 50.2	38.2
5	257 50.0	38.6
6	272 49.8	−21 39.0
7	287 49.5	39.4
8	302 49.3	39.8
9	317 49.1	40.2
10	332 48.9	40.6
11	347 48.6	41.0
12	2 48.4	−21 41.4
13	17 48.2	41.8
14	32 47.9	42.2
15	47 47.7	42.6
16	62 47.5	43.0
17	77 47.2	43.4
18	92 47.0	−21 43.8
19	107 46.8	44.2
20	122 46.6	44.6
21	137 46.3	45.0
22	152 46.1	45.4
23	167 45.9	45.8
1 0	182 45.6	−21 46.2
1	197 45.4	46.6
2	212 45.2	46.9
3	227 44.9	47.3
4	242 44.7	47.7
5	257 44.5	48.1
6	272 44.2	−21 48.5
7	287 44.0	48.9
8	302 43.7	49.3
9	317 43.5	49.7
10	332 43.3	50.1
11	347 43.0	50.4
12	2 42.8	−21 50.8
13	17 42.6	51.2
14	32 42.3	51.6
15	47 42.1	52.0
16	62 41.9	52.4
17	77 41.6	52.7
18	92 41.4	−21 53.1
19	107 41.1	53.5
20	122 40.9	53.9
21	137 40.7	54.3
22	152 40.4	54.6
23	167 40.2	55.0
24	182 39.9	−21 55.4
code	—	− 4

No.	Name	SHA	Dec.
		° ′	° ′
7	Acamar	315 50.1	−40 28.6
5	Achernar	335 57.8	−57 27.4
30	Acrux	173 57.1	−62 51.4
19	Adhara	255 45.5	−28 54.7
10	Aldebaran	291 37.7	+16 25.5
32	Alioth	166 58.2	+56 11.3
34	Alkaid	153 32.6	+49 31.5
55	Al Na'ir	28 37.0	−47 10.3
15	Alnilam	276 29.1	− 1 13.7
25	Alphard	218 37.6	− 8 28.3
41	Alphecca	126 47.3	+26 51.5
1	Alpheratz	358 27.3	+28 51.4
51	Altair	62 49.8	+ 8 45.4
2	Ankaa	353 57.3	−42 32.5
42	Antares	113 18.7	−26 20.2
37	Arcturus	146 34.7	+19 24.3
43	Atria	108 59.2	−68 57.0
22	Avior	234 35.0	−59 22.1
13	Bellatrix	279 17.2	+ 6 18.7
16	Betelg'se	271 46.9	+ 7 24.0
17	Canopus	264 14.5	−52 40.2
12	Capella	281 36.7	+45 57.3
53	Deneb	50 00.6	+45 07.9
28	Denebola	183 17.0	+14 48.6
4	Diphda	349 38.2	−18 13.3
27	Dubhe	194 43.7	+61 58.7
14	Elnath	279 05.9	+28 34.3
47	Eltanin	91 06.4	+51 29.8
54	Enif	34 28.8	+ 9 40.8
56	Fomalhaut	16 10.7	−29 51.1
31	Gacrux	172 48.5	−56 52.1
29	Gienah	176 36.1	−17 18.1
35	Hadar	149 48.6	−60 09.8
6	Hamal	328 48.4	+23 15.7
48	Kaus Aust.	84 40.4	−34 24.4
40	Kochab	137 19.2	+74 19.8
57	Markab	14 20.5	+14 58.6
8	Menkar	314 59.1	+ 3 55.4
36	Menkent	148 58.0	−36 09.4
24	Miapl'dus	221 48.4	−69 32.2
9	Mirfak	309 40.6	+49 42.7
50	Nunki	76 51.2	−26 21.1
52	Peacock	54 26.3	−56 52.6
21	Pollux	244 19.3	+28 07.7
20	Procyon	245 43.9	+ 5 20.1
46	R'alhague	96 46.2	+12 35.5
26	Regulus	208 28.6	+12 10.6
11	Rigel	281 52.5	− 8 15.0
38	Rigil Kent.	140 50.3	−60 39.4
44	Sabik	103 01.5	−15 40.3
3	Schedar	350 28.6	+56 18.4
45	Shaula	97 19.9	−37 04.4
18	Sirius	259 10.8	−16 39.3
33	Spica	159 16.2	−10 56.2
23	Suhail	223 23.5	−43 15.3
49	Vega	81 08.1	+38 44.8
39	Zub'g'bi	137 52.7	−15 51.8

GMT	Equation of Time (App.—Mean) 29	30	1
h	m s	m s	m s
0	+11 46.3	+11 25.0	+11 03.0
6	+11 41.1	+11 19.5	+10 57.3
12	+11 35.7	+11 14.0	+10 51.7
18	+11 30.4	+11 08.5	+10 46.0
24	+11 25.0	+11 03.0	+10 40.3

Lat.	Sunrise	Twlt. begins	Moonrise 29	30	1	2
N °	h m	h m	h m	h m	h m	h m
72	▬	6 21	6 42	9 34	▬	▬
70	▬	6 14	6 11	8 13	▬	▬
68	10 31	6 09	5 49	7 35	9 18	10 48
66	9 44	6 04	5 32	7 08	8 38	9 55
64	9 14	6 00	5 18	6 48	8 11	9 22
62	8 51	5 56	5 06	6 31	7 50	8 58
60	8 33	5 53	4 56	6 18	7 33	8 39
58	8 18	5 49	4 47	6 06	7 19	8 23
56	8 05	5 47	4 40	5 56	7 07	8 09
54	7 54	5 44	4 33	5 47	6 56	7 58
52	7 44	5 40	4 27	5 39	6 47	7 47
50	7 36	5 37	4 22	5 32	6 38	7 38
45	7 17	5 31	4 10	5 17	6 20	7 19
40	7 02	5 25	4 00	5 04	6 06	7 03
35	6 49	5 19	3 52	4 54	5 53	6 50
30	6 38	5 13	3 45	4 44	5 43	6 38
20	6 18	4 59	3 32	4 29	5 24	6 19
10	6 01	4 47	3 21	4 15	5 08	6 02
0	5 45	4 31	3 11	4 02	4 54	5 46
10	5 29	4 12	3 01	3 49	4 39	5 30
20	5 12	3 49	2 51	3 36	4 23	5 13
30	4 51	3 17	2 39	3 20	4 05	4 53
35	4 40	2 57	2 32	3 11	3 54	4 42
40	4 26	2 28	2 24	3 01	3 42	4 28
45	4 10	1 49	2 15	2 49	3 28	4 13
50	3 49	0 22	2 04	2 35	3 11	3 54
52	3 40	////	1 59	2 28	3 03	3 45
54	3 29	////	1 53	2 21	2 54	3 35
56	3 16	////	1 47	2 13	2 44	3 24
58	3 02	////	1 40	2 03	2 33	3 11
60	2 45	////	1 32	1 53	2 20	2 56
S						

Lat.	Sunset	Twlt. ends	Moonset 29	30	1	2
N °	h m	h m	h m	h m	h m	h m
72	▬	17 14	11 47	10 42	▬	▬
70	▬	17 20	12 19	12 04	▬	▬
68	13 06	17 26	12 43	12 43	12 48	13 05
66	13 53	17 31	13 01	13 11	13 28	13 59
64	14 23	17 35	13 16	13 32	13 55	14 32
62	14 46	17 39	13 29	13 49	14 17	14 56
60	15 04	17 43	13 40	14 03	14 34	15 16
58	15 19	17 46	13 49	14 15	14 48	15 31
56	15 32	17 50	13 57	14 26	15 01	15 45
54	15 43	17 53	14 04	14 35	15 12	15 57
52	15 53	17 56	14 11	14 43	15 21	16 07
50	16 02	17 59	14 17	14 51	15 30	16 16
45	16 20	18 05	14 30	15 07	15 48	16 36
40	16 36	18 12	14 41	15 20	16 04	16 52
35	16 49	18 18	14 50	15 31	16 16	17 05
30	17 00	18 24	14 58	15 41	16 27	17 17
20	17 19	18 37	15 12	15 58	16 46	17 37
10	17 36	18 51	15 24	16 13	17 03	17 54
0	17 52	19 06	15 35	16 27	17 18	18 10
10	18 09	19 26	15 47	16 41	17 34	18 27
20	18 26	19 49	15 59	16 55	17 51	18 44
30	18 46	20 20	16 13	17 13	18 10	19 04
35	18 58	20 42	16 22	17 23	18 21	19 15
40	19 12	21 10	16 31	17 34	18 34	19 29
45	19 29	21 51	16 42	17 47	18 49	19 45
50	19 49	23 24	16 55	18 04	19 07	20 04
52	19 59	////	17 01	18 12	19 16	20 13
54	20 10	////	17 08	18 20	19 26	20 23
56	20 22	////	17 16	18 30	19 37	20 35
58	20 37	////	17 25	18 41	19 50	20 49
60	20 54	////	17 35	18 54	20 05	21 04
S						

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
29	9 23	9 39	19 15	7 23	11 43
30	10 14	9 40	19 13	7 20	11 39
1	11 06	9 41	19 10	7 16	11 36
2	11 58	9 42	19 08	7 13	11 32

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.5	0.1	0.2
30	0.5	0.1	0.1
45	0.5	0.1	0.1
60	0.5	0.0	0.1
75	0.5	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	29	30	1
°	′	′	′
0	15.7	15.0	14.4
4	15.7	15.0	14.4
8	15.7	15.0	14.4
12	15.7	15.1	14.4
16	15.7	15.1	14.4
20	15.7	15.1	14.5
24	15.7	15.1	14.5
28	15.7	15.1	14.5
32	15.7	15.1	14.6
36	15.7	15.1	14.6
40	15.7	15.1	14.6
44	15.6	15.2	14.7
48	15.6	15.2	14.7
52	15.6	15.2	14.8
56	15.6	15.2	14.8
60	15.6	15.3	14.9
64	15.6	15.3	14.9
68	15.6	15.3	15.0
72	15.6	15.3	15.1
76	15.6	15.4	15.1
80	15.6	15.4	15.2
84	15.6	15.4	15.2
88	15.6	15.4	15.3
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	29	30	1
°	′	′	′
0	15.5	15.8	16.2
4	15.5	15.8	16.2
8	15.5	15.8	16.2
12	15.5	15.8	16.2
16	15.5	15.8	16.2
20	15.5	15.8	16.1
24	15.5	15.8	16.1
28	15.5	15.8	16.1
32	15.5	15.8	16.1
36	15.5	15.8	16.1
40	15.5	15.8	16.0
44	15.5	15.7	16.0
48	15.5	15.7	15.9
52	15.5	15.7	15.9
56	15.5	15.7	15.8
60	15.5	15.7	15.8
64	15.5	15.6	15.7
68	15.5	15.6	15.7
72	15.5	15.6	15.6
76	15.6	15.6	15.6
80	15.6	15.5	15.5
84	15.6	15.5	15.4
88	15.6	15.5	15.4
90	15.6	15.4	15.3

Subtract from table, back cover

G M T	♈ GHA	VENUS −3.4 GHA	Dec.	MARS −0.4 GHA	Dec.	JUPITER −1.5 GHA	Dec.	SATURN 0.7 GHA	Dec.	MOON GHA	code	Dec.	code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
2 0	70 48.6	214 37.4	−12 26.2	72 32.6	− 1 27.2	251 30.7	+ 1 34.6	186 31.4	−19 38.2	186 45.6	96	−20 40.1	− 26
1	85 51.1	229 36.9	27.2	87 34.0	26.7	266 32.9	34.5	201 33.6	38.2	201 14.2	97	20 42.7	− 25
2	100 53.5	244 36.3	28.2	102 35.5	26.1	281 35.0	34.3	216 35.7	38.3	215 42.9	96	20 45.2	− 24
3	115 56.0	259 35.8	·· 29.2	117 36.9	·· 25.5	296 37.2	·· 34.2	231 37.9	·· 38.3	230 11.5	97	·20 47.6	− 22
4	130 58.5	274 35.3	30.2	132 38.3	25.0	311 39.4	34.1	246 40.0	38.4	244 40.2	97	20 49.8	− 22
5	146 00.9	289 34.8	31.3	147 39.7	24.4	326 41.5	34.0	261 42.2	38.4	259 08.9	97	20 52.0	− 20
6	161 03.4	304 34.3	−12 32.3	162 41.1	− 1 23.8	341 43.7	+ 1 33.9	276 44.3	−19 38.5	Partial eclipse of the Sun December 2, visible over most of Europe and Asia.			
7	176 05.8	319 33.7	33.3	177 42.5	23.3	356 45.9	33.7	291 46.5	38.6				
8	191 08.3	334 33.2	34.3	192 43.9	22.7	11 48.1	33.6	306 48.7	38.6				
9	206 10.8	349 32.7	·· 35.3	207 45.3	·· 22.2	26 50.2	·· 33.5	321 50.8	·· 38.7				
10	221 13.2	4 32.2	36.3	222 46.7	21.6	41 52.4	33.4	336 53.0	38.7	331 32.4	98	21 01.0	− 15
11	236 15.7	19 31.7	37.3	237 48.2	21.0	56 54.6	33.3	351 55.1	38.8	346 01.2	97	21 02.5	− 14
12	251 18.2	34 31.1	−12 38.4	252 49.6	− 1 20.5	71 56.7	+ 1 33.2	6 57.3	−19 38.8	0 29.9	98	−21 03.9	− 12
13	266 20.6	49 30.6	39.4	267 51.0	19.9	86 58.9	33.0	21 59.4	38.9	14 58.7	98	21 05.1	− 11
14	281 23.1	64 30.1	40.4	282 52.4	19.3	102 01.1	32.9	37 01.6	38.9	29 27.5	98	21 06.2	− 11
15	296 25.6	79 29.6	·· 41.4	297 53.8	·· 18.8	117 03.2	·· 32.8	52 03.7	·· 39.0	43 56.3	98	·21 07.3	− 9
16	311 28.0	94 29.1	42.4	312 55.2	18.2	132 05.4	32.7	67 05.9	39.0	58 25.1	99	21 08.2	− 8
17	326 30.5	109 28.5	43.4	327 56.6	17.6	147 07.6	32.6	82 08.0	39.1	72 54.0	98	21 09.0	− 7
18	341 33.0	124 28.0	−12 44.4	342 58.0	− 1 17.1	162 09.8	+ 1 32.5	97 10.2	−19 39.1	87 22.8	99	−21 09.7	− 6
19	356 35.4	139 27.5	45.4	357 59.4	16.5	177 11.9	32.3	112 12.4	39.2	101 51.7	99	21 10.3	− 5
20	11 37.9	154 27.0	46.4	13 00.8	16.0	192 14.1	32.2	127 14.5	39.2	116 20.6	99	21 10.8	− 3
21	26 40.3	169 26.4	·· 47.5	28 02.2	·· 15.4	207 16.3	·· 32.1	142 16.7	·· 39.3	130 49.5	99	·21 11.1	− 3
22	41 42.8	184 25.9	48.5	43 03.6	14.8	222 18.4	32.0	157 18.8	39.3	145 18.4	100	21 11.4	− 1
23	56 45.3	199 25.4	49.5	58 05.0	14.3	237 20.6	31.9	172 21.0	39.4	159 47.4	100	21 11.5	0
3 0	71 47.7	214 24.9	−12 50.5	73 06.4	− 1 13.7	252 22.8	+ 1 31.8	187 23.1	−19 39.4	174 16.4	100	−21 11.5	0
1	86 50.2	229 24.3	51.5	88 07.8	13.1	267 25.0	31.6	202 25.3	39.5	188 45.4	100	21 11.5	+ 2
2	101 52.7	244 23.8	52.5	103 09.2	12.6	282 27.1	31.5	217 27.4	39.5	203 14.4	101	21 11.3	+ 3
3	116 55.1	259 23.3	·· 53.5	118 10.6	·· 12.0	297 29.3	·· 31.4	232 29.6	·· 39.6	217 43.5	101	·21 11.0	+ 4
4	131 57.6	274 22.8	54.5	133 12.0	11.4	312 31.5	31.3	247 31.7	39.7	232 12.6	101	21 10.6	+ 5
5	147 00.1	289 22.2	55.5	148 13.4	10.9	327 33.7	31.2	262 33.9	39.7	246 41.7	101	21 10.1	+ 7
6	162 02.5	304 21.7	−12 56.5	163 14.8	− 1 10.3	342 35.8	+ 1 31.1	277 36.1	−19 39.8	261 10.8	102	−21 09.4	+ 7
7	177 05.0	319 21.2	57.5	178 16.2	09.7	357 38.0	31.0	292 38.2	39.8	275 40.0	102	21 08.7	+ 8
8	192 07.4	334 20.6	58.5	193 17.6	09.2	12 40.2	30.8	307 40.4	39.9	290 09.2	102	21 07.9	+ 10
9	207 09.9	349 20.1	·12 59.5	208 19.0	·· 08.6	27 42.4	·· 30.7	322 42.5	·· 39.9	304 38.4	103	·21 06.9	+ 10
10	222 12.4	4 19.6	13 00.5	223 20.4	08.0	42 44.5	30.6	337 44.7	40.0	319 07.7	103	21 05.9	+ 12
11	237 14.8	19 19.0	01.5	238 21.8	07.5	57 46.7	30.5	352 46.8	40.0	333 37.0	103	21 04.7	+ 12
12	252 17.3	34 18.5	−13 02.5	253 23.2	− 1 06.9	72 48.9	+ 1 30.4	7 49.0	−19 40.1	348 06.3	104	−21 03.5	+ 14
13	267 19.8	49 18.0	03.5	268 24.6	06.3	87 51.1	30.3	22 51.1	40.1	2 35.7	104	21 02.1	+ 15
14	282 22.2	64 17.4	04.5	283 26.0	05.8	102 53.2	30.1	37 53.3	40.2	17 05.1	104	21 00.6	+ 16
15	297 24.7	79 16.9	·· 05.5	298 27.4	·· 05.2	117 55.4	·· 30.0	52 55.5	·· 40.2	31 34.5	105	·20 59.0	+ 17
16	312 27.2	94 16.4	06.5	313 28.8	04.6	132 57.6	29.9	67 57.6	40.3	46 04.0	105	20 57.3	+ 18
17	327 29.6	109 15.8	07.5	328 30.2	04.1	147 59.8	29.8	82 59.8	40.3	60 33.5	105	20 55.5	+ 18
18	342 32.1	124 15.3	−13 08.5	343 31.6	− 1 03.5	163 01.9	+ 1 29.7	98 01.9	−19 40.4	75 03.0	106	−20 53.7	+ 20
19	357 34.6	139 14.8	09.5	358 33.0	02.9	178 04.1	29.6	113 04.1	40.4	89 32.6	106	20 51.7	+ 21
20	12 37.0	154 14.2	10.5	13 34.4	02.4	193 06.3	29.5	128 06.2	40.5	104 02.2	106	20 49.6	+ 23
21	27 39.5	169 13.7	·· 11.5	28 35.8	·· 01.8	208 08.5	·· 29.3	143 08.4	·· 40.5	118 31.8	107	·20 47.3	+ 23
22	42 41.9	184 13.2	12.5	43 37.2	01.2	223 10.7	29.2	158 10.5	40.6	133 01.5	107	20 45.0	+ 24
23	57 44.4	199 12.6	13.5	58 38.6	00.7	238 12.8	29.1	173 12.7	40.6	147 31.2	108	20 42.6	+ 25
4 0	72 46.9	214 12.1	−13 14.5	73 40.0	− 1 00.1	253 15.0	+ 1 29.0	188 14.8	−19 40.7	162 01.0	108	−20 40.1	+ 26
1	87 49.3	229 11.6	15.5	88 41.4	0 59.5	268 17.2	28.9	203 17.0	40.7	176 30.8	108	20 37.5	+ 27
2	102 51.8	244 11.0	16.5	103 42.8	59.0	283 19.4	28.8	218 19.2	40.8	191 00.6	109	20 34.8	+ 28
3	117 54.3	259 10.5	·· 17.5	118 44.2	·· 58.4	298 21.5	·· 28.7	233 21.3	·· 40.8	205 30.5	110	·20 32.0	+ 29
4	132 56.7	274 09.9	18.5	133 45.5	57.8	313 23.7	28.6	248 23.5	40.9	220 00.5	109	20 29.1	+ 30
5	147 59.2	289 09.4	19.5	148 46.9	57.3	328 25.9	28.4	263 25.6	41.0	234 30.4	111	20 26.1	+ 31
6	163 01.7	304 08.9	−13 20.5	163 48.3	− 0 56.7	343 28.1	+ 1 28.3	278 27.8	−19 41.0	249 00.5	110	−20 23.0	+ 32
7	178 04.1	319 08.3	21.4	178 49.7	56.1	358 30.3	28.2	293 29.9	41.1	263 30.5	111	20 19.8	+ 33
8	193 06.6	334 07.8	22.4	193 51.1	55.6	13 32.4	28.1	308 32.1	41.1	278 00.6	112	20 16.5	+ 34
9	208 09.1	349 07.2	·· 23.4	208 52.5	·· 55.0	28 34.6	·· 28.0	323 34.2	·· 41.2	292 30.8	112	·20 13.1	+ 35
10	223 11.5	4 06.7	24.4	223 53.9	54.4	43 36.8	27.9	338 36.4	41.2	307 01.0	112	20 09.6	+ 36
11	238 14.0	19 06.2	25.4	238 55.3	53.9	58 39.0	27.8	353 38.5	41.3	321 31.2	113	20 06.0	+ 37
12	253 16.4	34 05.6	−13 26.4	253 56.7	− 0 53.3	73 41.2	+ 1 27.7	8 40.7	−19 41.3	336 01.5	113	−20 02.3	+ 38
13	268 18.9	49 05.1	27.4	268 58.0	52.7	88 43.3	27.5	23 42.9	41.4	350 31.8	114	19 58.5	+ 38
14	283 21.4	64 04.5	28.4	283 59.4	52.1	103 45.5	27.4	38 45.0	41.4	5 02.2	114	19 54.7	+ 40
15	298 23.8	79 04.0	·· 29.4	299 00.8	·· 51.6	118 47.7	·· 27.3	53 47.2	·· 41.5	19 32.6	115	·19 50.7	+ 41
16	313 26.3	94 03.4	30.3	314 02.2	51.0	133 49.9	27.2	68 49.3	41.5	34 03.1	115	19 46.6	+ 41
17	328 28.8	109 02.9	31.3	329 03.6	50.4	148 52.1	27.1	83 51.5	41.6	48 33.6	116	19 42.5	+ 43
18	343 31.2	124 02.3	−13 32.3	344 05.0	− 0 49.9	163 54.3	+ 1 27.0	98 53.6	−19 41.6	63 04.2	116	−19 38.2	+ 43
19	358 33.7	139 01.8	33.3	359 06.4	49.3	178 56.4	26.9	113 55.8	41.7	77 34.8	117	19 33.9	+ 44
20	13 36.2	154 01.3	34.3	14 07.7	48.7	193 58.6	26.8	128 57.9	41.7	92 05.5	117	19 29.5	+ 45
21	28 38.6	169 00.7	·· 35.3	29 09.1	·· 48.2	209 00.8	·· 26.6	144 00.1	·· 41.8	106 36.2	117	·19 25.0	+ 46
22	43 41.1	184 00.2	36.3	44 10.5	47.6	224 03.0	26.5	159 02.3	41.8	121 06.9	118	19 20.4	+ 47
23	58 43.6	198 59.6	37.2	59 11.9	47.0	239 05.2	26.4	174 04.4	41.9	135 37.7	119	19 15.7	+ 48
24	73 46.0	213 59.1	−13 38.2	74 13.3	− 0 46.4	254 07.3	+ 1 26.3	189 06.6	−19 41.9	150 08.6	119	−19 10.9	+ 49
code	—	− 5	− 10	+ 14	+ 6	+ 22	− 1	+ 21	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
2 0	182 39.9	−21 55.4	7	Acamar	315 50.1	−40 28.6
1	197 39.7	55.8	5	Achernar	335 57.9	−57 27.4
2	212 39.5	56.1	30	Acrux	173 57.0	−62 51.4
3	227 39.2	56.5	19	Adhara	255 45.5	−28 54.7
4	242 39.0	56.9	10	Aldebaran	291 37.7	+16 25.5
5	257 38.7	57.3				
6	272 38.5	−21 57.6	32	Alioth	166 58.2	+56 11.3
7	287 38.3	58.0	34	Alkaid	153 32.6	+49 31.5
8	302 38.0	58.4	55	Al Na'ir	28 37.0	−47 10.3
9	317 37.8	58.7	15	Alnilam	276 29.1	− 1 13.7
10	332 37.5	59.1	25	Alphard	218 37.6	− 8 28.3
11	347 37.3	59.5				
12	2 37.0	−21 59.8	41	Alphecca	126 47.3	+26 51.5
13	17 36.8	22 00.2	1	Alpheratz	358 27.3	+28 51.4
14	32 36.6	00.6	51	Altair	62 49.8	+ 8 45.4
15	47 36.3	00.9	2	Ankaa	353 57.3	−42 32.5
16	62 36.1	01.3	42	Antares	113 18.7	−26 20.2
17	77 35.8	01.7				
18	92 35.6	−22 02.0	37	Arcturus	146 34.7	+19 24.3
19	107 35.3	02.4	43	Atria	108 59.2	−68 57.0
20	122 35.1	02.8	22	Avior	234 35.0	−59 22.1
21	137 34.9	03.1	13	Bellatrix	279 17.2	+ 6 18.7
22	152 34.6	03.5	16	Betelg'se	271 46.9	+ 7 24.0
23	167 34.4	03.8				
			17	Canopus	264 14.5	−52 40.2
3 0	182 34.1	−22 04.2	12	Capella	281 36.6	+45 57.3
1	197 33.9	04.5	53	Deneb	50 00.6	+45 07.9
2	212 33.6	04.9	28	Denebola	183 16.9	+14 48.6
3	227 33.4	05.3	4	Diphda	349 38.2	−18 13.3
4	242 33.1	05.6				
5	257 32.9	06.0	27	Dubhe	194 43.7	+61 58.6
6	272 32.6	−22 06.3	14	Elnath	279 05.9	+28 34.3
7	287 32.4	06.7	47	Eltanin	91 06.4	+51 29.8
8	302 32.1	07.0	54	Enif	34 28.8	+ 9 40.8
9	317 31.9	07.4	56	Fomalhaut	16 10.7	−29 51.1
10	332 31.6	07.7				
11	347 31.4	08.1	31	Gacrux	172 48.4	−56 52.1
12	2 31.1	−22 08.4	29	Gienah	176 36.1	−17 18.1
13	17 30.9	08.8	35	Hadar	149 48.6	−60 09.8
14	32 30.6	09.1	6	Hamal	328 48.4	+23 15.7
15	47 30.4	09.5	48	Kaus Aust.	84 40.4	−34 24.4
16	62 30.1	09.8				
17	77 29.9	10.2	40	Kochab	137 19.2	+74 19.7
18	92 29.6	−22 10.5	57	Markab	14 20.6	+14 58.6
19	107 29.4	10.9	8	Menkar	314 59.1	+ 3 55.4
20	122 29.1	11.2	36	Menkent	148 57.9	−36 09.4
21	137 28.9	11.5	24	Miapl'dus	221 48.3	−69 32.2
22	152 28.6	11.9				
23	167 28.4	12.2	9	Mirfak	309 40.6	+49 42.7
			50	Nunki	76 51.2	−26 21.1
4 0	182 28.1	−22 12.6	52	Peacock	54 26.3	−56 52.6
1	197 27.9	12.9	21	Pollux	244 19.3	+28 07.7
2	212 27.6	13.2	20	Procyon	245 43.8	+ 5 20.1
3	227 27.4	13.6				
4	242 27.1	13.9	46	R'alhague	96 46.2	+12 35.5
5	257 26.9	14.3	26	Regulus	208 28.5	+12 10.6
6	272 26.6	−22 14.6	11	Rigel	281 52.5	− 8 15.0
7	287 26.4	14.9	38	Rigil Kent.	140 50.3	−60 39.4
8	302 26.1	15.3	44	Sabik	103 01.5	−15 40.3
9	317 25.8	15.6				
10	332 25.6	15.9	3	Schedar	350 28.6	+56 18.4
11	347 25.3	16.3	45	Shaula	97 19.9	−37 04.4
12	2 25.1	−22 16.6	18	Sirius	259 10.8	−16 39.4
13	17 24.8	16.9	33	Spica	159 16.2	−10 56.2
14	32 24.6	17.3	23	Suhail	223 23.4	−43 15.4
15	47 24.3	17.6				
16	62 24.1	17.9	49	Vega	81 08.1	+38 44.8
17	77 23.8	18.2	39	Zub'g'bi	137 52.7	−15 51.8
18	92 23.5	−22 18.6				
19	107 23.3	18.9				
20	122 23.0	19.2				
21	137 22.8	19.5				
22	152 22.5	19.9				
23	167 22.3	20.2				
24	182 22.0	−22 20.5				
code	—	− 4				

Lat.	Sunrise	Twlt. begins	Moonrise 2	3	4	5
N °	h m	h m	h m	h m	h m	h m
72	▬	6 28	▬	▬	▬	14 19
70	▬	6 21	▬	▬	▬	12 41
68	10 49	6 15	10 48	11 41	11 57	12 01
66	9 54	6 10	9 55	10 47	11 17	11 33
64	9 22	6 05	9 22	10 15	10 49	11 12
62	8 58	6 01	8 58	9 51	10 28	10 54
60	8 39	5 57	8 39	9 32	10 11	10 40
58	8 23	5 54	8 23	9 16	9 57	10 28
56	8 10	5 50	8 09	9 02	9 44	10 17
54	7 59	5 47	7 58	8 50	9 33	10 08
52	7 48	5 44	7 47	8 40	9 24	10 00
50	7 39	5 41	7 38	8 31	9 15	9 52
45	7 20	5 34	7 19	8 11	8 57	9 36
40	7 05	5 28	7 03	7 56	8 42	9 23
35	6 51	5 21	6 50	7 42	8 29	9 12
30	6 40	5 14	6 38	7 30	8 18	9 02
20	6 20	5 01	6 19	7 11	7 59	8 45
10	6 03	4 47	6 02	6 53	7 43	8 30
0	5 46	4 32	5 46	6 37	7 27	8 16
10	5 30	4 12	5 30	6 21	7 12	8 02
20	5 12	3 49	5 13	6 04	6 55	7 47
30	4 51	3 16	4 53	5 44	6 36	7 30
35	4 39	2 55	4 42	5 32	6 25	7 20
40	4 25	2 26	4 28	5 19	6 12	7 08
45	4 08	1 45	4 13	5 03	5 57	6 55
50	3 48	////	3 54	4 44	5 39	6 38
52	3 38	////	3 45	4 34	5 30	6 30
54	3 27	////	3 35	4 24	5 20	6 22
56	3 14	////	3 24	4 12	5 09	6 12
58	2 59	////	3 11	3 59	4 56	6 01
60	2 41	////	2 56	3 43	4 41	5 48

Lat.	Sunset	Twlt. ends	Moonset 2	3	4	5
N °	h m	h m	h m	h m	h m	h m
72	▬	17 09	▬	▬	▬	14 48
70	▬	17 17	▬	▬	▬	16 24
68	12 50	17 23	13 05	14 00	15 28	17 03
66	13 45	17 28	13 59	14 53	16 07	17 30
64	14 18	17 33	14 32	15 26	16 34	17 51
62	14 42	17 38	14 56	15 50	16 55	18 08
60	15 00	17 41	15 16	16 09	17 12	18 21
58	15 16	17 45	15 31	16 24	17 26	18 33
56	15 29	17 48	15 45	16 38	17 38	18 43
54	15 41	17 52	15 57	16 49	17 49	18 52
52	15 51	17 55	16 07	17 00	17 58	19 00
50	16 00	17 57	16 16	17 09	18 07	19 08
45	16 19	18 04	16 36	17 28	18 24	19 23
40	16 35	18 12	16 52	17 44	18 39	19 36
35	16 48	18 18	17 05	17 57	18 51	19 46
30	17 00	18 25	17 17	18 09	19 02	19 56
20	17 20	18 38	17 37	18 28	19 20	20 12
10	17 37	18 52	17 54	18 45	19 36	20 25
0	17 54	19 08	18 10	19 01	19 51	20 38
10	18 10	19 27	18 27	19 17	20 06	20 51
20	18 28	19 51	18 44	19 34	20 21	21 05
30	18 49	20 24	19 04	19 54	20 39	21 21
35	19 01	20 46	19 15	20 05	20 50	21 30
40	19 15	21 14	19 29	20 18	21 02	21 40
45	19 32	21 57	19 45	20 34	21 16	21 52
50	19 53	////	20 04	20 53	21 33	22 07
52	20 03	////	20 13	21 01	21 41	22 13
54	20 14	////	20 23	21 11	21 50	22 21
56	20 27	////	20 35	21 23	22 00	22 29
58	20 42	////	20 49	21 36	22 12	22 39
60	21 00	////	21 04	21 51	22 25	22 50

GMT	Equation of Time (App.—Mean) 2	3	4
h	m s	m s	m s
0	+10 40.3	+10 16.9	+ 9 53.0
6	+10 34.5	+10 11.0	+ 9 46.9
12	+10 28.7	+10 05.0	+ 9 40.8
18	+10 22.8	+ 9 59.1	+ 9 34.7
24	+10 16.9	+ 9 53.0	+ 9 28.5

DAY	GMT of Transit Meridian of Greenwich Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
2	11 58	9 42	19 08	7 13	11 32
3	12 49	9 43	19 06	7 09	11 29
4	13 39	9 44	19 04	7 06	11 25
5	14 27	9 44	19 01	7 03	11 22

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.6	0.1	0.2
30	0.6	0.1	0.1
45	0.6	0.1	0.1
60	0.6	0.0	0.1
75	0.6	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	2	3	4
°	′	′	′
0	13.8	13.3	12.8
4	13.8	13.3	12.8
8	13.8	13.3	12.8
12	13.8	13.3	12.8
16	13.8	13.3	12.9
20	13.9	13.4	12.9
24	13.9	13.4	13.0
28	14.0	13.5	13.0
32	14.0	13.6	13.1
36	14.1	13.6	13.2
40	14.1	13.7	13.3
44	14.2	13.8	13.4
48	14.3	13.9	13.5
52	14.3	14.0	13.7
56	14.4	14.1	13.8
60	14.5	14.2	13.9
64	14.6	14.3	14.1
68	14.7	14.4	14.2
72	14.8	14.6	14.3
76	14.9	14.7	14.5
80	15.0	14.8	14.6
84	15.1	14.9	14.8
88	15.1	15.0	14.9
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	2	3	4
°	′	′	′
0	16.6	16.9	17.2
4	16.6	16.8	17.1
8	16.5	16.8	17.1
12	16.5	16.8	17.1
16	16.5	16.8	17.0
20	16.5	16.7	17.0
24	16.4	16.7	16.9
28	16.4	16.6	16.9
32	16.3	16.6	16.8
36	16.3	16.5	16.7
40	16.2	16.4	16.6
44	16.1	16.3	16.5
48	16.1	16.2	16.4
52	16.0	16.1	16.2
56	15.9	16.0	16.1
60	15.8	15.9	16.0
64	15.7	15.8	15.8
68	15.6	15.7	15.7
72	15.6	15.6	15.6
76	15.5	15.4	15.4
80	15.4	15.3	15.3
84	15.3	15.2	15.1
88	15.2	15.1	15.0
90			

Subtract from table, back cover

First Sunday in Advent 2
New Moon 2

GMT	♈ GHA	VENUS −3.4 GHA	VENUS −3.4 Dec.	MARS −0.3 GHA	MARS −0.3 Dec.	JUPITER −1.5 GHA	JUPITER −1.5 Dec.	SATURN 0.7 GHA	SATURN 0.7 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
5 00	73 46.0	213 59.1	−13 38.2	74 13.3	− 0 46.4	254 07.3	+ 1 26.3	189 06.6	−19 41.9	150 08.6	119	−19 10.9	+ 49
01	88 48.5	228 58.5	39.2	89 14.6	45.9	269 09.5	26.2	204 08.7	42.0	164 39.5	120	19 06.0	+ 49
02	103 50.9	243 58.0	40.2	104 16.0	45.3	284 11.7	26.1	219 10.9	42.0	179 10.5	120	19 01.1	+ 50
03	118 53.4	258 57.4	·· 41.2	119 17.4	·· 44.7	299 13.9	·· 26.0	234 13.0	·· 42.1	193 41.5	120	·18 56.1	+ 52
04	133 55.9	273 56.9	42.1	134 18.8	44.2	314 16.1	25.9	249 15.2	42.1	208 12.5	121	18 50.9	+ 52
05	148 58.3	288 56.3	43.1	149 20.2	43.6	329 18.3	25.8	264 17.3	42.2	222 43.6	122	18 45.7	+ 53
06	164 00.8	303 55.8	−13 44.1	164 21.5	− 0 43.0	344 20.5	+ 1 25.6	279 19.5	−19 42.2	237 14.8	122	−18 40.4	+ 53
07	179 03.3	318 55.2	45.1	179 22.9	42.4	359 22.6	25.5	294 21.7	42.3	251 46.0	123	18 35.1	+ 55
08	194 05.7	333 54.7	46.1	194 24.3	41.9	14 24.8	25.4	309 23.8	42.3	266 17.3	123	18 29.6	+ 55
09	209 08.2	348 54.1	·· 47.0	209 25.7	·· 41.3	29 27.0	·· 25.3	324 26.0	·· 42.4	280 48.6	123	·18 24.1	+ 56
10	224 10.7	3 53.5	48.0	224 27.1	40.7	44 29.2	25.2	339 28.1	42.4	295 19.9	124	18 18.5	+ 57
11	239 13.1	18 53.0	49.0	239 28.4	40.2	59 31.4	25.1	354 30.3	42.5	309 51.3	125	18 12.8	+ 58
12	254 15.6	33 52.4	−13 50.0	254 29.8	− 0 39.6	74 33.6	+ 1 25.0	9 32.4	−19 42.6	324 22.8	125	−18 07.0	+ 59
13	269 18.0	48 51.9	50.9	269 31.2	39.0	89 35.7	24.9	24 34.6	42.6	338 54.3	126	18 01.1	+ 59
14	284 20.5	63 51.3	51.9	284 32.6	38.4	104 37.9	24.8	39 36.7	42.7	353 25.9	126	17 55.2	+ 60
15	299 23.0	78 50.8	·· 52.9	299 33.9	·· 37.9	119 40.1	·· 24.7	54 38.9	·· 42.7	7 57.5	127	·17 49.2	+ 61
16	314 25.4	93 50.2	53.9	314 35.3	37.3	134 42.3	24.5	69 41.0	42.8	22 29.2	127	17 43.1	+ 62
17	329 27.9	108 49.7	54.8	329 36.7	36.7	149 44.5	24.4	84 43.2	42.8	37 00.9	127	17 36.9	+ 62
18	344 30.4	123 49.1	−13 55.8	344 38.1	− 0 36.2	164 46.7	+ 1 24.3	99 45.4	−19 42.9	51 32.6	128	−17 30.7	+ 64
19	359 32.8	138 48.5	56.8	359 39.4	35.6	179 48.9	24.2	114 47.5	42.9	66 04.4	129	17 24.3	+ 64
20	14 35.3	153 48.0	57.7	14 40.8	35.0	194 51.1	24.1	129 49.7	43.0	80 36.3	129	17 17.9	+ 64
21	29 37.8	168 47.4	·· 58.7	29 42.2	·· 34.4	209 53.2	·· 24.0	144 51.8	·· 43.0	95 08.2	130	·17 11.5	+ 66
22	44 40.2	183 46.9	13 59.7	44 43.6	33.9	224 55.4	23.9	159 54.0	43.1	109 40.2	130	17 04.9	+ 66
23	59 42.7	198 46.3	14 00.7	59 44.9	33.3	239 57.6	23.8	174 56.1	43.1	124 12.2	131	16 58.3	+ 67
6 00	74 45.2	213 45.8	−14 01.6	74 46.3	− 0 32.7	254 59.8	+ 1 23.7	189 58.3	−19 43.2	138 44.3	131	−16 51.6	+ 67
01	89 47.6	228 45.2	02.6	89 47.7	32.1	270 02.0	23.6	205 00.4	43.2	153 16.4	131	16 44.9	+ 69
02	104 50.1	243 44.6	03.6	104 49.0	31.6	285 04.2	23.5	220 02.6	43.3	167 48.5	132	16 38.0	+ 69
03	119 52.5	258 44.1	·· 04.5	119 50.4	·· 31.0	300 06.4	·· 23.3	235 04.8	·· 43.3	182 20.7	133	·16 31.1	+ 69
04	134 55.0	273 43.5	05.5	134 51.8	30.4	315 08.6	23.2	250 06.9	43.4	196 53.0	133	16 24.2	+ 71
05	149 57.5	288 42.9	06.5	149 53.1	29.8	330 10.8	23.1	265 09.1	43.4	211 25.3	134	16 17.1	+ 71
06	164 59.9	303 42.4	−14 07.4	164 54.5	− 0 29.3	345 12.9	+ 1 23.0	280 11.2	−19 43.5	225 57.7	134	−16 10.0	+ 71
07	180 02.4	318 41.8	08.4	179 55.9	28.7	0 15.1	22.9	295 13.4	43.5	240 30.1	134	16 02.9	+ 73
08	195 04.9	333 41.3	09.4	194 57.3	28.1	15 17.3	22.8	310 15.5	43.6	255 02.5	135	15 55.6	+ 73
09	210 07.3	348 40.7	·· 10.3	209 58.6	·· 27.6	30 19.5	·· 22.7	325 17.7	·· 43.6	269 35.0	136	·15 48.3	+ 74
10	225 09.8	3 40.1	11.3	225 00.0	27.0	45 21.7	22.6	340 19.8	43.7	284 07.6	136	15 40.9	+ 74
11	240 12.3	18 39.6	12.2	240 01.4	26.4	60 23.9	22.5	355 22.0	43.7	298 40.2	136	15 33.5	+ 75
12	255 14.7	33 39.0	−14 13.2	255 02.7	− 0 25.8	75 26.1	+ 1 22.4	10 24.2	−19 43.8	313 12.8	137	−15 26.0	+ 76
13	270 17.2	48 38.4	14.2	270 04.1	25.3	90 28.3	22.3	25 26.3	43.8	327 45.5	137	15 18.4	+ 76
14	285 19.7	63 37.9	15.1	285 05.4	24.7	105 30.5	22.2	40 28.5	43.9	342 18.2	138	15 10.8	+ 77
15	300 22.1	78 37.3	·· 16.1	300 06.8	·· 24.1	120 32.7	·· 22.0	55 30.6	·· 43.9	356 51.0	138	·15 03.1	+ 77
16	315 24.6	93 36.7	17.1	315 08.2	23.5	135 34.9	21.9	70 32.8	44.0	11 23.8	139	14 55.4	+ 79
17	330 27.0	108 36.2	18.0	330 09.5	23.0	150 37.1	21.8	85 34.9	44.0	25 56.7	139	14 47.5	+ 78
18	345 29.5	123 35.6	−14 19.0	345 10.9	− 0 22.4	165 39.2	+ 1 21.7	100 37.1	−19 44.1	40 29.6	140	−14 39.7	+ 80
19	0 32.0	138 35.0	19.9	0 12.3	21.8	180 41.4	21.6	115 39.2	44.1	55 02.6	140	14 31.7	+ 80
20	15 34.4	153 34.5	20.9	15 13.6	21.2	195 43.6	21.5	130 41.4	44.2	69 35.6	140	14 23.7	+ 80
21	30 36.9	168 33.9	·· 21.8	30 15.0	·· 20.7	210 45.8	·· 21.4	145 43.6	·· 44.2	84 08.6	141	·14 15.7	+ 81
22	45 39.4	183 33.3	22.8	45 16.4	20.1	225 48.0	21.3	160 45.7	44.3	98 41.7	142	14 07.6	+ 82
23	60 41.8	198 32.7	23.8	60 17.7	19.5	240 50.2	21.2	175 47.9	44.3	113 14.9	141	13 59.4	+ 82
7 00	75 44.3	213 32.2	−14 24.7	75 19.1	− 0 18.9	255 52.4	+ 1 21.1	190 50.0	−19 44.4	127 48.0	142	−13 51.2	+ 83
01	90 46.8	228 31.6	25.7	90 20.4	18.3	270 54.6	21.0	205 52.2	44.4	142 21.2	143	13 42.9	+ 83
02	105 49.2	243 31.0	26.6	105 21.8	17.8	285 56.8	20.9	220 54.3	44.5	156 54.5	143	13 34.6	+ 84
03	120 51.7	258 30.5	·· 27.6	120 23.2	·· 17.2	300 59.0	·· 20.8	235 56.5	·· 44.5	171 27.8	143	·13 26.2	+ 84
04	135 54.1	273 29.9	28.5	135 24.5	16.6	316 01.2	20.7	250 58.6	44.6	186 01.1	144	13 17.8	+ 85
05	150 56.6	288 29.3	29.5	150 25.9	16.0	331 03.4	20.6	266 00.8	44.6	200 34.5	144	13 09.3	+ 86
06	165 59.1	303 28.7	−14 30.4	165 27.2	− 0 15.5	346 05.6	+ 1 20.5	281 03.0	−19 44.7	215 07.9	145	−13 00.7	+ 86
07	181 01.5	318 28.2	31.4	180 28.6	14.9	1 07.8	20.3	296 05.1	44.7	229 41.4	145	12 52.1	+ 86
08	196 04.0	333 27.6	32.3	195 30.0	14.3	16 10.0	20.2	311 07.3	44.8	244 14.9	145	12 43.5	+ 87
09	211 06.5	348 27.0	·· 33.3	210 31.3	·· 13.7	31 12.2	·· 20.1	326 09.4	·· 44.8	258 48.4	146	·12 34.8	+ 88
10	226 08.9	3 26.4	34.2	225 32.7	13.2	46 14.4	20.0	341 11.6	44.9	273 22.0	146	12 26.0	+ 88
11	241 11.4	18 25.9	35.2	240 34.0	12.6	61 16.6	19.9	356 13.7	44.9	287 55.6	146	12 17.2	+ 88
12	256 13.9	33 25.3	−14 36.1	255 35.4	− 0 12.0	76 18.8	+ 1 19.8	11 15.9	−19 45.0	302 29.2	147	−12 08.4	+ 89
13	271 16.3	48 24.7	37.1	270 36.7	11.4	91 20.9	19.7	26 18.1	45.0	317 02.9	147	11 59.5	+ 90
14	286 18.8	63 24.1	38.0	285 38.1	10.9	106 23.1	19.6	41 20.2	45.1	331 36.6	148	11 50.5	+ 90
15	301 21.3	78 23.5	·· 39.0	300 39.4	·· 10.3	121 25.3	·· 19.5	56 22.4	·· 45.1	346 10.4	148	·11 41.5	+ 90
16	316 23.7	93 23.0	39.9	315 40.8	09.7	136 27.5	19.4	71 24.5	45.2	0 44.2	148	11 32.5	+ 91
17	331 26.2	108 22.4	40.9	330 42.2	09.1	151 29.7	19.3	86 26.7	45.2	15 18.0	148	11 23.4	+ 91
18	346 28.6	123 21.8	−14 41.8	345 43.5	− 0 08.5	166 31.9	+ 1 19.2	101 28.8	−19 45.3	29 51.8	149	−11 14.3	+ 92
19	1 31.1	138 21.2	42.7	0 44.9	08.0	181 34.1	19.1	116 31.0	45.3	44 25.7	149	11 05.1	+ 92
20	16 33.6	153 20.6	43.7	15 46.2	07.4	196 36.3	19.0	131 33.1	45.4	58 59.6	150	10 55.9	+ 93
21	31 36.0	168 20.1	·· 44.6	30 47.6	·· 06.8	211 38.5	·· 18.9	146 35.3	·· 45.4	73 33.6	149	·10 46.6	+ 93
22	46 38.5	183 19.5	45.6	45 48.9	06.2	226 40.7	18.8	161 37.5	45.5	88 07.5	150	10 37.3	+ 93
23	61 41.0	198 18.9	46.5	60 50.3	05.6	241 42.9	18.7	176 39.6	45.6	102 41.5	151	10 28.0	+ 94
24	76 43.4	213 18.3	−14 47.5	75 51.6	− 0 05.1	256 45.1	+ 1 18.6	191 41.8	−19 45.6	117 15.6	150	−10 18.6	+ 95
code	—	− 6	− 10	+ 14	+ 5	+ 22	− 1	+ 21	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
5 00	182 22.0	−22 20.5	7	Acamar	315 50.1	−40 28.7
01	197 21.7	20.8	5	Achernar	335 57.9	−57 27.5
02	212 21.5	21.2	30	Acrux	173 57.0	−62 51.4
03	227 21.2	21.5	19	Adhara	255 45.5	−28 54.7
04	242 21.0	21.8	10	Aldebaran	291 37.7	+16 25.5
05	257 20.7	22.1				
06	272 20.5	−22 22.4	32	Alioth	166 58.1	+56 11.3
07	287 20.2	22.7	34	Alkaid	153 32.6	+49 31.4
08	302 19.9	23.1	55	Al Na'ir	28 37.0	−47 10.3
09	317 19.7	23.4	15	Alnilam	276 29.1	− 1 13.7
10	332 19.4	23.7	25	Alphard	218 37.6	− 8 28.3
11	347 19.1	24.0				
12	2 18.9	−22 24.3	41	Alphecca	126 47.3	+26 51.5
13	17 18.6	24.6	1	Alpheratz	358 27.3	+28 51.4
14	32 18.4	24.9	51	Altair	62 49.8	+ 8 45.4
15	47 18.1	25.3	2	Ankaa	353 57.3	−42 32.5
16	62 17.8	25.6	42	Antares	113 18.7	−26 20.2
17	77 17.6	25.9				
18	92 17.3	−22 26.2	37	Arcturus	146 34.7	+19 24.3
19	107 17.1	26.5	43	Atria	108 59.1	−68 57.0
20	122 16.8	26.8	22	Avior	234 34.9	−59 22.1
21	137 16.5	27.1	13	Bellatrix	279 17.1	+ 6 18.7
22	152 16.3	27.4	16	Betelg'se	271 46.9	+ 7 24.0
23	167 16.0	27.7				
			17	Canopus	264 14.4	−52 40.3
6 00	182 15.7	−22 28.0	12	Capella	281 36.6	+45 57.3
01	197 15.5	28.3	53	Deneb	50 00.6	+45 07.9
02	212 15.2	28.6	28	Denebola	183 16.9	+14 48.6
03	227 14.9	28.9	4	Diphda	349 38.2	−18 13.3
04	242 14.7	29.2				
05	257 14.4	29.5	27	Dubhe	194 43.6	+61 58.6
06	272 14.2	−22 29.8	14	Elnath	279 05.8	+28 34.3
07	287 13.9	30.1	47	Eltanin	91 06.4	+51 29.8
08	302 13.6	30.4	54	Enif	34 28.9	+ 9 40.8
09	317 13.4	30.7	56	Fomalhaut	16 10.7	−29 51.1
10	332 13.1	31.0				
11	347 12.8	31.3	31	Gacrux	172 48.4	−56 52.1
12	2 12.6	−22 31.6	29	Gienah	176 36.1	−17 18.1
13	17 12.3	31.9	35	Hadar	149 48.6	−60 09.8
14	32 12.0	32.2	6	Hamal	328 48.4	+23 15.7
15	47 11.8	32.5	48	Kaus Aust.	84 40.4	−34 24.4
16	62 11.5	32.8				
17	77 11.2	33.1	40	Kochab	137 19.2	+74 19.7
18	92 11.0	−22 33.4	57	Markab	14 20.6	+14 58.6
19	107 10.7	33.7	8	Menkar	314 59.1	+ 3 55.4
20	122 10.4	33.9	36	Menkent	148 57.9	−36 09.4
21	137 10.2	34.2	24	Miapl'dus	221 48.3	−69 32.2
22	152 09.9	34.5				
23	167 09.6	34.8	9	Mirfak	309 40.6	+49 42.7
			50	Nunki	76 51.2	−26 21.1
7 00	182 09.3	−22 35.1	52	Peacock	54 26.4	−56 52.6
01	197 09.1	35.4	21	Pollux	244 19.2	+28 07.7
02	212 08.8	35.7	20	Procyon	245 43.8	+ 5 20.1
03	227 08.5	35.9				
04	242 08.3	36.2	46	R'alhague	96 46.2	+12 35.5
05	257 08.0	36.5	26	Regulus	208 28.5	+12 10.6
06	272 07.7	−22 36.8	11	Rigel	281 52.5	− 8 15.0
07	287 07.5	37.1	38	Rigil Kent.	140 50.2	−60 39.4
08	302 07.2	37.4	44	Sabik	103 01.5	−15 40.3
09	317 06.9	37.6				
10	332 06.6	37.9	3	Schedar	350 28.6	+56 18.4
11	347 06.4	38.2	45	Shaula	97 19.9	−37 04.4
12	2 06.1	−22 38.5	18	Sirius	259 10.8	−16 39.4
13	17 05.8	38.7	33	Spica	159 16.2	−10 56.2
14	32 05.6	39.0	23	Suhail	223 23.4	−43 15.4
15	47 05.3	39.3				
16	62 05.0	39.6	49	Vega	81 08.1	+38 44.8
17	77 04.7	39.8	39	Zub'g'bi	137 52.7	−15 51.8
18	92 04.5	−22 40.1				
19	107 04.2	40.4				
20	122 03.9	40.7				
21	137 03.7	40.9				
22	152 03.4	41.2				
23	167 03.1	41.5				
24	182 02.8	−22 41.7				
code	—	− 3				

Lat. N °	Sunrise h m	Twlt. begins h m	Moonrise 5 h m	6 h m	7 h m	8 h m
72	▬	6 34	14 19	13 01	12 37	12 21
70	▬	6 26	12 41	12 26	12 16	12 08
68	11 11	6 20	12 01	12 01	12 00	11 58
66	10 04	6 15	11 33	11 42	11 47	11 50
64	9 29	6 10	11 12	11 26	11 36	11 43
62	9 04	6 05	10 54	11 13	11 26	11 37
60	8 45	6 01	10 40	11 02	11 18	11 31
58	8 28	5 57	10 28	10 52	11 11	11 27
56	8 15	5 53	10 17	10 43	11 05	11 22
54	8 03	5 50	10 08	10 36	10 59	11 19
52	7 52	5 47	10 00	10 29	10 54	11 15
50	7 43	5 44	9 52	10 23	10 49	11 12
45	7 23	5 36	9 36	10 10	10 39	11 05
40	7 07	5 30	9 23	9 58	10 30	10 59
35	6 54	5 23	9 12	9 49	10 23	10 54
30	6 42	5 16	9 02	9 41	10 17	10 50
20	6 22	5 03	8 45	9 27	10 05	10 42
10	6 04	4 49	8 30	9 14	9 56	10 36
0	5 47	4 32	8 16	9 02	9 47	10 29
10	5 30	4 13	8 02	8 50	9 37	10 23
20	5 12	3 49	7 47	8 38	9 27	10 16
30	4 51	3 16	7 30	8 23	9 16	10 09
35	4 39	2 54	7 20	8 15	9 10	10 04
40	4 25	2 25	7 08	8 05	9 02	9 59
45	4 07	1 42	6 55	7 54	8 54	9 53
50	3 46	////	6 38	7 40	8 43	9 46
52	3 36	////	6 30	7 34	8 38	9 43
54	3 24	////	6 22	7 27	8 33	9 39
56	3 11	////	6 12	7 19	8 27	9 35
58	2 56	////	6 01	7 10	8 20	9 31
60	2 37	////	5 48	7 00	8 12	9 26

Lat. N °	Sunset h m	Twlt. ends h m	Moonset 5 h m	6 h m	7 h m	8 h m
72	▬	17 05	14 48	17 40	19 35	21 20
70	▬	17 14	16 24	18 14	19 54	21 30
68	12 31	17 21	17 03	18 38	20 09	21 39
66	13 38	17 26	17 30	18 56	20 21	21 46
64	14 13	17 31	17 51	19 11	20 32	21 51
62	14 38	17 36	18 08	19 23	20 40	21 56
60	14 57	17 39	18 21	19 34	20 47	22 01
58	15 14	17 44	18 33	19 43	20 54	22 05
56	15 27	17 47	18 43	19 51	21 00	22 08
54	15 39	17 50	18 52	19 58	21 05	22 11
52	15 50	17 54	19 00	20 05	21 09	22 14
50	15 59	17 57	19 08	20 10	21 13	22 17
45	16 19	18 05	19 23	20 22	21 22	22 22
40	16 35	18 12	19 36	20 33	21 30	22 27
35	16 48	18 18	19 46	20 41	21 36	22 30
30	17 00	18 25	19 56	20 49	21 42	22 34
20	17 20	18 38	20 12	21 02	21 51	22 40
10	17 38	18 53	20 25	21 13	22 00	22 45
0	17 55	19 10	20 38	21 24	22 07	22 50
10	18 12	19 29	20 51	21 34	22 15	22 55
20	18 30	19 53	21 05	21 45	22 23	23 00
30	18 51	20 26	21 21	21 58	22 33	23 05
35	19 03	20 48	21 30	22 06	22 38	23 09
40	19 18	21 18	21 40	22 14	22 44	23 12
45	19 35	22 02	21 52	22 23	22 51	23 16
50	19 56	////	22 07	22 35	22 59	23 22
52	20 07	////	22 13	22 40	23 03	23 24
54	20 18	////	22 21	22 46	23 08	23 26
56	20 32	////	22 29	22 53	23 12	23 29
58	20 47	////	22 39	23 00	23 17	23 32
60	21 06	////	22 50	23 09	23 23	23 36

GMT h	Equation of Time (App.—Mean) 5 m s	6 m s	7 m s
0	+ 9 28.5	+ 9 03.5	+ 8 37.9
6	+ 9 22.3	+ 8 57.1	+ 8 31.4
12	+ 9 16.1	+ 8 50.8	+ 8 24.9
18	+ 9 09.8	+ 8 44.4	+ 8 18.4
24	+ 9 03.5	+ 8 37.9	+ 8 11.9

DAY	GMT of Transit Meridian of Greenwich Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
5	14 27	9 44	19 01	7 03	11 22
6	15 13	9 45	18 59	6 59	11 19
7	15 57	9 46	18 57	6 56	11 15
8	16 40	9 47	18 55	6 52	11 12

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.6	0.1	0.2
30	0.6	0.1	0.1
45	0.6	0.1	0.1
60	0.6	0.0	0.1
75	0.6	0.0	0.0
90			

Moon's Lower Limb Add

Alt. °	5 ′	6 ′	7 ′
0	12.2	12.0	11.9
4	12.3	12.0	11.9
8	12.3	12.0	11.9
12	12.3	12.1	11.9
16	12.4	12.1	12.0
20	12.4	12.2	12.1
24	12.5	12.3	12.2
28	12.6	12.4	12.2
32	12.7	12.5	12.4
36	12.8	12.6	12.5
40	12.9	12.7	12.6
44	13.0	12.8	12.7
48	13.2	13.0	12.9
52	13.3	13.1	13.1
56	13.5	13.3	13.2
60	13.6	13.5	13.4
64	13.8	13.6	13.6
68	14.0	13.8	13.8
72	14.1	14.0	14.0
76	14.3	14.2	14.2
80	14.5	14.4	14.4
84	14.7	14.6	14.6
88	14.8	14.7	14.7
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt. °	5 ′	6 ′	7 ′
0	17.4	17.6	17.7
4	17.4	17.6	17.6
8	17.4	17.5	17.6
12	17.4	17.5	17.6
16	17.3	17.5	17.5
20	17.3	17.4	17.5
24	17.2	17.3	17.4
28	17.1	17.2	17.3
32	17.0	17.1	17.2
36	16.9	17.0	17.0
40	16.8	16.9	16.9
44	16.6	16.7	16.8
48	16.5	16.6	16.6
52	16.4	16.4	16.5
56	16.2	16.3	16.3
60	16.1	16.1	16.1
64	15.9	15.9	15.9
68	15.7	15.7	15.8
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.2
84	15.0	15.0	15.0
88	14.9	14.8	14.8
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.4 GHA	VENUS −3.4 Dec.	MARS −0.2 GHA	MARS −0.2 Dec.	JUPITER −1.5 GHA	JUPITER −1.5 Dec.	SATURN 0.7 GHA	SATURN 0.7 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
8 00	76 43.4	213 18.3	−14 47.5	75 51.6	− 0 05.1	256 45.1	+ 1 18.6	191 41.8	−19 45.6	117 15.6	150	−10 18.6	+ 95
01	91 45.9	228 17.7	48.4	90 53.0	04.5	271 47.3	18.5	206 43.9	45.7	131 49.6	151	10 09.1	+ 95
02	106 48.4	243 17.1	49.3	105 54.3	03.9	286 49.5	18.4	221 46.1	45.7	146 23.7	151	9 59.6	+ 95
03	121 50.8	258 16.6	·· 50.3	120 55.7	·· 03.3	301 51.7	·· 18.3	236 48.2	·· 45.8	160 57.8	151	· 9 50.1	+ 95
04	136 53.3	273 16.0	51.2	135 57.0	02.8	316 53.9	18.1	251 50.4	45.8	175 31.9	152	9 40.6	+ 96
05	151 55.8	288 15.4	52.2	150 58.4	02.2	331 56.1	18.0	266 52.6	45.9	190 06.1	152	9 31.0	+ 96
06	166 58.2	303 14.8	−14 53.1	165 59.7	− 0 01.6	346 58.3	+ 1 17.9	281 54.7	−19 45.9	204 40.3	152	− 9 21.4	+ 97
07	182 00.7	318 14.2	54.0	181 01.1	01.0	2 00.5	17.8	296 56.9	46.0	219 14.5	152	9 11.7	+ 97
08	197 03.1	333 13.6	55.0	196 02.4	− 0 00.4	17 02.7	17.7	311 59.0	46.0	233 48.7	153	9 02.0	+ 98
09	212 05.6	348 13.0	·· 55.9	211 03.8	+ 0 00.1	32 04.9	·· 17.6	327 01.2	·· 46.1	248 23.0	153	· 8 52.2	+ 98
10	227 08.1	3 12.5	56.8	226 05.1	00.7	47 07.1	17.5	342 03.3	46.1	262 57.3	153	8 42.4	+ 98
11	242 10.5	18 11.9	57.8	241 06.5	01.3	62 09.3	17.4	357 05.5	46.2	277 31.6	153	8 32.6	+ 98
12	257 13.0	33 11.3	−14 58.7	256 07.8	+ 0 01.9	77 11.5	+ 1 17.3	12 07.6	−19 46.2	292 05.9	153	− 8 22.8	+ 99
13	272 15.5	48 10.7	14 59.6	271 09.2	02.5	92 13.7	17.2	27 09.8	46.3	306 40.2	154	8 12.9	+ 99
14	287 17.9	63 10.1	15 00.6	286 10.5	03.0	107 16.0	17.1	42 12.0	46.3	321 14.6	154	8 03.0	+100
15	302 20.4	78 09.5	·· 01.5	301 11.8	·· 03.6	122 18.2	·· 17.0	57 14.1	·· 46.4	335 49.0	154	· 7 53.0	+100
16	317 22.9	93 08.9	02.4	316 13.2	04.2	137 20.4	16.9	72 16.3	46.4	350 23.4	154	7 43.0	+100
17	332 25.3	108 08.3	03.4	331 14.5	04.8	152 22.6	16.8	87 18.4	46.5	4 57.8	154	7 33.0	+100
18	347 27.8	123 07.7	−15 04.3	346 15.9	+ 0 05.4	167 24.8	+ 1 16.7	102 20.6	−19 46.5	19 32.2	155	− 7 23.0	+101
19	2 30.3	138 07.1	05.2	1 17.2	05.9	182 27.0	16.6	117 22.7	46.6	34 06.7	154	7 12.9	+101
20	17 32.7	153 06.5	06.1	16 18.6	06.5	197 29.2	16.5	132 24.9	46.6	48 41.1	155	7 02.8	+102
21	32 35.2	168 06.0	·· 07.1	31 19.9	·· 07.1	212 31.4	·· 16.4	147 27.1	·· 46.7	63 15.6	155	· 6 52.6	+101
22	47 37.6	183 05.4	08.0	46 21.2	07.7	227 33.6	16.3	162 29.2	46.7	77 50.1	155	6 42.5	+102
23	62 40.1	198 04.8	08.9	61 22.6	08.3	242 35.8	16.2	177 31.4	46.8	92 24.6	155	6 32.3	+103
9 00	77 42.6	213 04.2	−15 09.9	76 23.9	+ 0 08.8	257 38.0	+ 1 16.1	192 33.5	−19 46.8	106 59.1	155	− 6 22.0	+102
01	92 45.0	228 03.6	10.8	91 25.3	09.4	272 40.2	16.0	207 35.7	46.9	121 33.6	155	6 11.8	+103
02	107 47.5	243 03.0	11.7	106 26.6	10.0	287 42.4	15.9	222 37.8	46.9	136 08.1	155	6 01.5	+103
03	122 50.0	258 02.4	·· 12.6	121 28.0	·· 10.6	302 44.6	·· 15.8	237 40.0	·· 47.0	150 42.6	156	· 5 51.2	+104
04	137 52.4	273 01.8	13.5	136 29.3	11.2	317 46.8	15.7	252 42.2	47.0	165 17.2	155	5 40.8	+103
05	152 54.9	288 01.2	14.5	151 30.6	11.7	332 49.0	15.6	267 44.3	47.1	179 51.7	156	5 30.5	+104
06	167 57.4	303 00.6	−15 15.4	166 32.0	+ 0 12.3	347 51.2	+ 1 15.5	282 46.5	−19 47.1	194 26.3	156	− 5 20.1	+104
07	182 59.8	318 00.0	16.3	181 33.3	12.9	2 53.4	15.4	297 48.6	47.2	209 00.9	155	5 09.7	+105
08	198 02.3	332 59.4	17.2	196 34.7	13.5	17 55.6	15.3	312 50.8	47.2	223 35.4	156	4 59.2	+104
09	213 04.7	347 58.8	·· 18.2	211 36.0	·· 14.1	32 57.8	·· 15.2	327 52.9	·· 47.3	238 10.0	156	· 4 48.8	+105
10	228 07.2	2 58.2	19.1	226 37.3	14.7	48 00.1	15.1	342 55.1	47.3	252 44.6	156	4 38.3	+105
11	243 09.7	17 57.6	20.0	241 38.7	15.2	63 02.3	15.0	357 57.2	47.4	267 19.2	155	4 27.8	+106
12	258 12.1	32 57.0	−15 20.9	256 40.0	+ 0 15.8	78 04.5	+ 1 14.9	12 59.4	−19 47.4	281 53.7	156	− 4 17.2	+105
13	273 14.6	47 56.4	21.8	271 41.3	16.4	93 06.7	14.8	28 01.6	47.5	296 28.3	156	4 06.7	+106
14	288 17.1	62 55.8	22.7	286 42.7	17.0	108 08.9	14.7	43 03.7	47.5	311 02.9	156	3 56.1	+106
15	303 19.5	77 55.2	·· 23.7	301 44.0	·· 17.6	123 11.1	·· 14.6	58 05.9	·· 47.6	325 37.5	156	· 3 45.5	+106
16	318 22.0	92 54.6	24.6	316 45.3	18.1	138 13.3	14.5	73 08.0	47.6	340 12.1	155	3 34.9	+106
17	333 24.5	107 54.0	25.5	331 46.7	18.7	153 15.5	14.4	88 10.2	47.7	354 46.6	156	3 24.3	+107
18	348 26.9	122 53.4	−15 26.4	346 48.0	+ 0 19.3	168 17.7	+ 1 14.3	103 12.3	−19 47.7	9 21.2	156	− 3 13.6	+106
19	3 29.4	137 52.8	27.3	1 49.3	19.9	183 19.9	14.2	118 14.5	47.7	23 55.8	155	3 03.0	+107
20	18 31.9	152 52.2	28.2	16 50.7	20.5	198 22.1	14.1	133 16.7	47.8	38 30.3	156	2 52.3	+107
21	33 34.3	167 51.6	·· 29.1	31 52.0	·· 21.1	213 24.3	·· 14.0	148 18.8	·· 47.8	53 04.9	155	· 2 41.6	+107
22	48 36.8	182 51.0	30.1	46 53.3	21.6	228 26.6	13.9	163 21.0	47.9	67 39.4	156	2 30.9	+108
23	63 39.2	197 50.3	31.0	61 54.7	22.2	243 28.8	13.8	178 23.1	47.9	82 14.0	155	2 20.1	+107
10 00	78 41.7	212 49.7	−15 31.9	76 56.0	+ 0 22.8	258 31.0	+ 1 13.7	193 25.3	−19 48.0	96 48.5	155	− 2 09.4	+108
01	93 44.2	227 49.1	32.8	91 57.3	23.4	273 33.2	13.6	208 27.4	48.0	111 23.0	155	1 58.6	+108
02	108 46.6	242 48.5	33.7	106 58.7	24.0	288 35.4	13.5	223 29.6	48.1	125 57.5	155	1 47.8	+108
03	123 49.1	257 47.9	·· 34.6	122 00.0	·· 24.6	303 37.6	·· 13.4	238 31.8	·· 48.1	140 32.0	155	· 1 37.0	+108
04	138 51.6	272 47.3	35.5	137 01.3	25.1	318 39.8	13.3	253 33.9	48.2	155 06.5	155	1 26.2	+108
05	153 54.0	287 46.7	36.4	152 02.7	25.7	333 42.0	13.2	268 36.1	48.2	169 41.0	154	1 15.4	+108
06	168 56.5	302 46.1	−15 37.3	167 04.0	+ 0 26.3	348 44.2	+ 1 13.1	283 38.2	−19 48.3	184 15.4	155	− 1 04.6	+109
07	183 59.0	317 45.5	38.2	182 05.3	26.9	3 46.5	13.0	298 40.4	48.3	198 49.9	154	0 53.7	+108
08	199 01.4	332 44.9	39.1	197 06.7	27.5	18 48.7	12.9	313 42.5	48.4	213 24.3	154	0 42.9	+109
09	214 03.9	347 44.3	·· 40.0	212 08.0	·· 28.1	33 50.9	·· 12.8	328 44.7	·· 48.4	227 58.7	154	· 0 32.0	+109
10	229 06.4	2 43.6	40.9	227 09.3	28.6	48 53.1	12.7	343 46.9	48.5	242 33.1	154	0 21.1	+108
11	244 08.8	17 43.0	41.9	242 10.6	29.2	63 55.3	12.6	358 49.0	48.5	257 07.5	154	− 0 10.3	+109
12	259 11.3	32 42.4	−15 42.8	257 12.0	+ 0 29.8	78 57.5	+ 1 12.5	13 51.2	−19 48.6	271 41.9	153	+ 0 00.6	+109
13	274 13.7	47 41.8	43.7	272 13.3	30.4	93 59.7	12.4	28 53.3	48.6	286 16.2	153	0 11.5	+109
14	289 16.2	62 41.2	44.6	287 14.6	31.0	109 02.0	12.3	43 55.5	48.7	300 50.5	153	0 22.4	+109
15	304 18.7	77 40.6	·· 45.5	302 15.9	·· 31.6	124 04.2	·· 12.2	58 57.7	·· 48.7	315 24.8	153	· 0 33.3	+110
16	319 21.1	92 40.0	46.4	317 17.3	32.2	139 06.4	12.1	73 59.8	48.8	329 59.1	152	0 44.3	+109
17	334 23.6	107 39.3	47.3	332 18.6	32.7	154 08.6	12.0	89 02.0	48.8	344 33.3	152	0 55.2	+109
18	349 26.1	122 38.7	−15 48.2	347 19.9	+ 0 33.3	169 10.8	+ 1 11.9	104 04.1	−19 48.9	359 07.5	152	+ 1 06.1	+110
19	4 28.5	137 38.1	49.1	2 21.2	33.9	184 13.0	11.8	119 06.3	48.9	13 41.7	152	1 17.1	+109
20	19 31.0	152 37.5	49.9	17 22.6	34.5	199 15.2	11.7	134 08.4	49.0	28 15.9	151	1 28.0	+109
21	34 33.5	167 36.9	·· 50.8	32 23.9	·· 35.1	214 17.5	·· 11.6	149 10.6	·· 49.0	42 50.0	151	· 1 38.9	+110
22	49 35.9	182 36.3	51.7	47 25.2	35.7	229 19.7	11.5	164 12.8	49.1	57 24.1	151	1 49.9	+109
23	64 38.4	197 35.6	52.6	62 26.5	36.2	244 21.9	11.4	179 14.9	49.1	71 58.2	150	2 00.8	+110
24	79 40.9	212 35.0	−15 53.5	77 27.9	+ 0 36.8	259 24.1	+ 1 11.4	194 17.1	−19 49.2	86 32.2	150	+ 2 11.8	+109
code	−	− 6	− 9	+ 13	+ 6	+ 22	− 1	+ 22	− 1				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
8 0	182 02.8	−22 41.7	7	Acamar	315 50.1	−40 28.7
1	197 02.6	42.0	5	Achernar	335 57.9	−57 27.5
2	212 02.3	42.3	30	Acrux	173 56.9	−62 51.4
3	227 02.0	42.5	19	Adhara	255 45.5	−28 54.7
4	242 01.7	42.8	10	Aldebaran	291 37.7	+16 25.5
5	257 01.5	43.1				
6	272 01.2	−22 43.3	32	Alioth	166 58.1	+56 11.3
7	287 00.9	43.6	34	Alkaid	153 32.6	+49 31.4
8	302 00.6	43.8	55	Al Na'ir	28 37.0	−47 10.3
9	317 00.4	44.1	15	Alnilam	276 29.0	− 1 13.7
10	332 00.1	44.4	25	Alphard	218 37.6	− 8 28.3
11	346 59.8	44.6				
12	1 59.5	−22 44.9	41	Alphecca	126 47.3	+26 51.5
13	16 59.3	45.1	1	Alpheratz	358 27.3	+28 51.4
14	31 59.0	45.4	51	Altair	62 49.8	+ 8 45.4
15	46 58.7	45.6	2	Ankaa	353 57.3	−42 32.5
16	61 58.4	45.9	42	Antares	113 18.6	−26 20.2
17	76 58.1	46.2				
18	91 57.9	−22 46.4	37	Arcturus	146 34.6	+19 24.3
19	106 57.6	46.7	43	Atria	108 59.1	−68 57.0
20	121 57.3	46.9	22	Avior	234 34.9	−59 22.1
21	136 57.0	47.2	13	Bellatrix	279 17.1	+ 6 18.7
22	151 56.8	47.4	16	Betelg'se	271 46.8	+ 7 24.0
23	166 56.5	47.7				
			17	Canopus	264 14.4	−52 40.3
9 0	181 56.2	−22 47.9	12	Capella	281 36.6	+45 57.3
1	196 55.9	48.2	53	Deneb	50 00.7	+45 07.9
2	211 55.6	48.4	28	Denebola	183 16.9	+14 48.6
3	226 55.4	48.7	4	Diphda	349 38.2	−18 13.3
4	241 55.1	48.9				
5	256 54.8	49.1	27	Dubhe	194 43.6	+61 58.6
6	271 54.5	−22 49.4	14	Elnath	279 05.8	+28 34.3
7	286 54.2	49.6	47	Eltanin	91 06.4	+51 29.8
8	301 54.0	49.9	54	Enif	34 28.9	+ 9 40.8
9	316 53.7	50.1	56	Fomalhaut	16 10.7	−29 51.1
10	331 53.4	50.4				
11	346 53.1	50.6	31	Gacrux	172 48.4	−56 52.1
12	1 52.8	−22 50.8	29	Gienah	176 36.0	−17 18.1
13	16 52.6	51.1	35	Hadar	149 48.5	−60 09.8
14	31 52.3	51.3	6	Hamal	328 48.4	+23 15.7
15	46 52.0	51.6	48	Kaus Aust.	84 40.4	−34 24.4
16	61 51.7	51.8				
17	76 51.4	52.0	40	Kochab	137 19.2	+74 19.7
18	91 51.2	−22 52.3	57	Markab	14 20.6	+14 58.6
19	106 50.9	52.5	8	Menkar	314 59.1	+ 3 55.4
20	121 50.6	52.7	36	Menkent	148 57.9	−36 09.4
21	136 50.3	53.0	24	Miapl'dus	221 48.2	−69 32.2
22	151 50.0	53.2				
23	166 49.7	53.4	9	Mirfak	309 40.6	+49 42.7
			50	Nunki	76 51.2	−26 21.1
10 0	181 49.5	−22 53.7	52	Peacock	54 26.4	−56 52.6
1	196 49.2	53.9	21	Pollux	244 19.2	+28 07.7
2	211 48.9	54.1	20	Procyon	245 43.8	+ 5 20.1
3	226 48.6	54.3				
4	241 48.3	54.6	46	R'alhague	96 46.1	+12 35.5
5	256 48.0	54.8	26	Regulus	208 28.5	+12 10.5
6	271 47.8	−22 55.0	11	Rigel	281 52.5	− 8 15.0
7	286 47.5	55.2	38	Rigil Kent.	140 50.2	−60 39.4
8	301 47.2	55.5	44	Sabik	103 01.5	−15 40.3
9	316 46.9	55.7				
10	331 46.6	55.9	3	Schedar	350 28.7	+56 18.4
11	346 46.3	56.1	45	Shaula	97 19.9	−37 04.4
12	1 46.1	−22 56.4	18	Sirius	259 10.7	−16 39.4
13	16 45.8	56.6	33	Spica	159 16.1	−10 56.2
14	31 45.5	56.8	23	Suhail	223 23.4	−43 15.4
15	46 45.2	57.0				
16	61 44.9	57.2	49	Vega	81 08.1	+38 44.8
17	76 44.6	57.4	39	Zub'g'bi	137 52.7	−15 51.8
18	91 44.3	−22 57.7				
19	106 44.1	57.9				
20	121 43.8	58.1				
21	136 43.5	58.3				
22	151 43.2	58.5				
23	166 42.9	58.7				
24	181 42.6	−22 58.9				
code	—	− 3				

Lat.	Sunrise	Twlt. begins	Moonrise 8	9	10	11
N °	h m	h m	h m	h m	h m	h m
72	▬	6 39	12 21	12 07	11 54	11 42
70	▬	6 32	12 08	12 01	11 54	11 48
68	▬	6 25	11 58	11 56	11 54	11 52
66	10 13	6 19	11 50	11 52	11 54	11 56
64	9 36	6 14	11 43	11 49	11 54	12 00
62	9 10	6 09	11 37	11 46	11 54	12 03
60	8 49	6 05	11 31	11 43	11 54	12 05
58	8 33	6 00	11 27	11 41	11 54	12 08
56	8 19	5 57	11 22	11 38	11 54	12 10
54	8 07	5 53	11 19	11 37	11 54	12 12
52	7 56	5 50	11 15	11 35	11 54	12 13
50	7 46	5 47	11 12	11 33	11 54	12 15
45	7 26	5 39	11 05	11 30	11 54	12 18
40	7 10	5 32	10 59	11 27	11 54	12 21
35	6 56	5 26	10 54	11 24	11 54	12 24
30	6 44	5 19	10 50	11 22	11 54	12 26
20	6 24	5 05	10 42	11 18	11 54	12 30
10	6 06	4 50	10 36	11 15	11 53	12 33
0	5 49	4 33	10 29	11 11	11 53	12 36
10	5 32	4 14	10 23	11 08	11 53	12 40
20	5 13	3 49	10 16	11 05	11 53	12 43
30	4 52	3 16	10 09	11 01	11 53	12 47
35	4 39	2 53	10 04	10 59	11 53	12 50
40	4 24	2 24	9 59	10 56	11 53	12 52
45	4 07	1 38	9 53	10 53	11 54	12 55
50	3 45	////	9 46	10 50	11 54	12 59
52	3 35	////	9 43	10 48	11 54	13 01
54	3 23	////	9 39	10 46	11 54	13 03
56	3 09	////	9 35	10 44	11 54	13 05
58	2 54	////	9 31	10 42	11 54	13 07
60	2 34	////	9 26	10 39	11 54	13 10
S						

Lat.	Sunset	Twlt. ends	Moonset 8	9	10	11
N °	h m	h m	h m	h m	h m	h m
72	▬	17 03	21 20	23 01	24 42	0 42
70	▬	17 11	21 30	23 04	24 39	0 39
68	▬	17 18	21 39	23 07	24 37	0 37
66	13 32	17 25	21 46	23 10	24 34	0 34
64	14 09	17 30	21 51	23 12	24 33	0 33
62	14 35	17 34	21 56	23 13	24 31	0 31
60	14 55	17 39	22 01	23 15	24 30	0 30
58	15 12	17 43	22 05	23 16	24 28	0 28
56	15 26	17 47	22 08	23 17	24 27	0 27
54	15 38	17 50	22 11	23 18	24 26	0 26
52	15 49	17 54	22 14	23 19	24 25	0 25
50	15 58	17 57	22 17	23 20	24 25	0 25
45	16 18	18 04	22 22	23 22	24 23	0 23
40	16 35	18 12	22 27	23 24	24 22	0 22
35	16 48	18 18	22 30	23 25	24 20	0 20
30	17 00	18 25	22 34	23 26	24 19	0 19
20	17 21	18 39	22 40	23 28	24 17	0 17
10	17 39	18 54	22 45	23 30	24 15	0 15
0	17 56	19 11	22 50	23 32	24 14	0 14
10	18 13	19 30	22 55	23 33	24 12	0 12
20	18 32	19 56	23 00	23 35	24 10	0 10
30	18 53	20 29	23 05	23 37	24 08	0 08
35	19 06	20 52	23 09	23 38	24 07	0 07
40	19 20	21 21	23 12	23 39	24 06	0 06
45	19 38	22 07	23 16	23 41	24 05	0 05
50	20 00	////	23 22	23 42	24 03	0 03
52	20 10	////	23 24	23 43	24 02	0 02
54	20 22	////	23 26	23 44	24 01	0 01
56	20 36	////	23 29	23 45	24 00	0 00
58	20 52	////	23 32	23 46	23 59	24 13
60	21 11	////	23 36	23 47	23 58	24 09
S						

GMT	Equation of Time (App.—Mean) 8	9	10
h	m s	m s	m s
0	+ 8 11.9	+ 7 45.3	+ 7 18.4
6	+ 8 05.3	+ 7 38.6	+ 7 11.6
12	+ 7 58.7	+ 7 31.9	+ 7 04.8
18	+ 7 52.0	+ 7 25.2	+ 6 57.9
24	+ 7 45.3	+ 7 18.4	+ 6 51.1

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
8	16 40	9 47	18 55	6 52	11 12
9	17 22	9 48	18 53	6 49	11 08
10	18 04	9 49	18 51	6 45	11 05
11	18 47	9 50	18 49	6 41	11 01

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.6	0.1	0.2
30	0.6	0.1	0.1
45	0.6	0.1	0.1
60	0.6	0.0	0.1
75	0.6	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	8	9	10
°	′	′	′
0	12.0	12.2	12.8
4	12.0	12.3	12.8
8	12.0	12.3	12.8
12	12.1	12.3	12.8
16	12.1	12.4	12.9
20	12.2	12.4	12.9
24	12.3	12.5	13.0
28	12.4	12.6	13.0
32	12.5	12.7	13.1
36	12.6	12.8	13.2
40	12.7	12.9	13.3
44	12.8	13.0	13.4
48	13.0	13.2	13.5
52	13.1	13.3	13.7
56	13.3	13.5	13.8
60	13.5	13.6	13.9
64	13.6	13.8	14.1
68	13.8	14.0	14.2
72	14.0	14.1	14.3
76	14.2	14.3	14.5
80	14.4	14.5	14.6
84	14.6	14.7	14.8
88	14.7	14.8	14.9
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	8	9	10
°	′	′	′
0	17.6	17.4	17.2
4	17.6	17.4	17.1
8	17.5	17.4	17.1
12	17.5	17.4	17.1
16	17.5	17.3	17.0
20	17.4	17.3	17.0
24	17.3	17.2	16.9
28	17.2	17.1	16.9
32	17.1	17.0	16.8
36	17.0	16.9	16.7
40	16.9	16.8	16.6
44	16.7	16.6	16.5
48	16.6	16.5	16.4
52	16.4	16.4	16.2
56	16.3	16.2	16.1
60	16.1	16.1	16.0
64	15.9	15.9	15.8
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.4	15.4	15.4
80	15.2	15.2	15.3
84	15.0	15.0	15.1
88	14.8	14.9	15.0
90			

Subtract from table, back cover

First Quarter 10

GMT	♈ GHA	VENUS −3.4 GHA	VENUS −3.4 Dec.	MARS −0.1 GHA	MARS −0.1 Dec.	JUPITER −1.5 GHA	JUPITER −1.5 Dec.	SATURN 0.7 GHA	SATURN 0.7 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
11 0	79 40.9	212 35.0	−15 53.5	77 27.9	+ 0 36.8	259 24.1	+ 1 11.4	194 17.1	−19 49.2	86 32.2	150	+ 2 11.8	+109
1	94 43.3	227 34.4	54.4	92 29.2	37.4	274 26.3	11.3	209 19.2	49.2	101 06.2	150	2 22.7	+110
2	109 45.8	242 33.8	55.3	107 30.5	38.0	289 28.5	11.2	224 21.4	49.3	115 40.2	150	2 33.7	+109
3	124 48.2	257 33.2	·· 56.2	122 31.8	·· 38.6	304 30.8	·· 11.1	239 23.5	·· 49.3	130 14.2	149	· 2 44.6	+109
4	139 50.7	272 32.5	57.1	137 33.2	39.2	319 33.0	11.0	254 25.7	49.4	144 48.1	149	2 55.5	+110
5	154 53.2	287 31.9	58.0	152 34.5	39.8	334 35.2	10.9	269 27.9	49.4	159 22.0	148	3 06.5	+109
6	169 55.6	302 31.3	−15 58.9	167 35.8	+ 0 40.3	349 37.4	+ 1 10.8	284 30.0	−19 49.5	173 55.8	148	+ 3 17.4	+110
7	184 58.1	317 30.7	15 59.8	182 37.1	40.9	4 39.6	10.7	299 32.2	49.5	188 29.6	148	3 28.4	+109
8	200 00.6	332 30.0	16 00.7	197 38.4	41.5	19 41.8	10.6	314 34.3	49.6	203 03.4	147	3 39.3	+109
9	215 03.0	347 29.4	·· 01.5	212 39.8	·· 42.1	34 44.1	·· 10.5	329 36.5	·· 49.6	217 37.1	147	· 3 50.2	+109
10	230 05.5	2 28.8	02.4	227 41.1	42.7	49 46.3	10.4	344 38.6	49.7	232 10.8	146	4 01.1	+110
11	245 08.0	17 28.2	03.3	242 42.4	43.3	64 48.5	10.3	359 40.8	49.7	246 44.4	146	4 12.1	+109
12	260 10.4	32 27.6	−16 04.2	257 43.7	+ 0 43.9	79 50.7	+ 1 10.2	14 43.0	−19 49.8	261 18.0	146	+ 4 23.0	+109
13	275 12.9	47 26.9	05.1	272 45.0	44.4	94 52.9	10.1	29 45.1	49.8	275 51.6	145	4 33.9	+109
14	290 15.3	62 26.3	06.0	287 46.3	45.0	109 55.2	10.0	44 47.3	49.9	290 25.1	145	4 44.8	+109
15	305 17.8	77 25.7	·· 06.9	302 47.7	·· 45.6	124 57.4	·· 09.9	59 49.4	·· 49.9	304 58.6	144	· 4 55.7	+108
16	320 20.3	92 25.0	07.7	317 49.0	46.2	139 59.6	09.8	74 51.6	50.0	319 32.0	144	5 06.5	+109
17	335 22.7	107 24.4	08.6	332 50.3	46.8	155 01.8	09.7	89 53.8	50.0	334 05.4	143	5 17.4	+108
18	350 25.2	122 23.8	−16 09.5	347 51.6	+ 0 47.4	170 04.0	+ 1 09.6	104 55.9	−19 50.1	348 38.7	143	+ 5 28.2	+109
19	5 27.7	137 23.2	10.4	2 52.9	48.0	185 06.3	09.5	119 58.1	50.1	3 12.0	142	5 39.1	+108
20	20 30.1	152 22.5	11.3	17 54.2	48.5	200 08.5	09.4	135 00.2	50.2	17 45.2	142	5 49.9	+108
21	35 32.6	167 21.9	·· 12.2	32 55.6	·· 49.1	215 10.7	·· 09.3	150 02.4	·· 50.2	32 18.4	141	· 6 00.7	+108
22	50 35.1	182 21.3	13.0	47 56.9	49.7	230 12.9	09.3	165 04.5	50.3	46 51.5	141	6 11.5	+108
23	65 37.5	197 20.6	13.9	62 58.2	50.3	245 15.1	09.2	180 06.7	50.3	61 24.6	141	6 22.3	+108
12 0	80 40.0	212 20.0	−16 14.8	77 59.5	+ 0 50.9	260 17.4	+ 1 09.1	195 08.9	−19 50.4	75 57.7	139	+ 6 33.1	+107
1	95 42.5	227 19.4	15.7	93 00.8	51.5	275 19.6	09.0	210 11.0	50.4	90 30.6	139	6 43.8	+108
2	110 44.9	242 18.7	16.5	108 02.1	52.1	290 21.8	08.9	225 13.2	50.5	105 03.5	139	6 54.6	+107
3	125 47.4	257 18.1	·· 17.4	123 03.4	·· 52.7	305 24.0	·· 08.8	240 15.3	·· 50.5	119 36.4	138	· 7 05.3	+107
4	140 49.8	272 17.5	18.3	138 04.8	53.2	320 26.3	08.7	255 17.5	50.5	134 09.2	138	7 16.0	+107
5	155 52.3	287 16.8	19.2	153 06.1	53.8	335 28.5	08.6	270 19.7	50.6	148 42.0	136	7 26.7	+106
6	170 54.8	302 16.2	−16 20.0	168 07.4	+ 0 54.4	350 30.7	+ 1 08.5	285 21.8	−19 50.6	163 14.6	137	+ 7 37.3	+107
7	185 57.2	317 15.6	20.9	183 08.7	55.0	5 32.9	08.4	300 24.0	50.7	177 47.3	135	7 48.0	+106
8	200 59.7	332 14.9	21.8	198 10.0	55.6	20 35.1	08.3	315 26.1	50.7	192 19.8	135	7 58.6	+106
9	216 02.2	347 14.3	·· 22.7	213 11.3	·· 56.2	35 37.4	·· 08.2	330 28.3	·· 50.8	206 52.3	135	· 8 09.2	+105
10	231 04.6	2 13.7	23.5	228 12.6	56.8	50 39.6	08.1	345 30.4	50.8	221 24.8	134	8 19.7	+106
11	246 07.1	17 13.0	24.4	243 13.9	57.4	65 41.8	08.0	0 32.6	50.9	235 57.2	133	8 30.3	+105
12	261 09.6	32 12.4	−16 25.3	258 15.2	+ 0 57.9	80 44.0	+ 1 07.9	15 34.8	−19 50.9	250 29.5	132	+ 8 40.8	+105
13	276 12.0	47 11.8	26.1	273 16.6	58.5	95 46.3	07.9	30 36.9	51.0	265 01.7	132	8 51.3	+105
14	291 14.5	62 11.1	27.0	288 17.9	59.1	110 48.5	07.8	45 39.1	51.0	279 33.9	131	9 01.8	+104
15	306 17.0	77 10.5	·· 27.9	303 19.2	· 0 59.7	125 50.7	·· 07.7	60 41.2	·· 51.1	294 06.0	131	· 9 12.2	+104
16	321 19.4	92 09.8	28.7	318 20.5	1 00.3	140 52.9	07.6	75 43.4	51.1	308 38.1	130	9 22.6	+104
17	336 21.9	107 09.2	29.6	333 21.8	00.9	155 55.2	07.5	90 45.6	51.2	323 10.1	129	9 33.0	+103
18	351 24.3	122 08.6	−16 30.5	348 23.1	+ 1 01.5	170 57.4	+ 1 07.4	105 47.7	−19 51.2	337 42.0	128	+ 9 43.3	+103
19	6 26.8	137 07.9	31.3	3 24.4	02.1	185 59.6	07.3	120 49.9	51.3	352 13.8	128	9 53.6	+103
20	21 29.3	152 07.3	32.2	18 25.7	02.7	201 01.9	07.2	135 52.0	51.3	6 45.6	127	10 03.9	+103
21	36 31.7	167 06.6	·· 33.1	33 27.0	·· 03.2	216 04.1	·· 07.1	150 54.2	·· 51.4	21 17.3	126	· 10 14.2	+102
22	51 34.2	182 06.0	33.9	48 28.3	03.8	231 06.3	07.0	165 56.4	51.4	35 48.9	126	10 24.4	+101
23	66 36.7	197 05.4	34.8	63 29.6	04.4	246 08.5	06.9	180 58.5	51.5	50 20.5	124	10 34.5	+102
13 0	81 39.1	212 04.7	−16 35.6	78 30.9	+ 1 05.0	261 10.8	+ 1 06.8	196 00.7	−19 51.5	64 51.9	124	+10 44.7	+101
1	96 41.6	227 04.1	36.5	93 32.2	05.6	276 13.0	06.8	211 02.8	51.6	79 23.3	124	10 54.8	+100
2	111 44.1	242 03.4	37.4	108 33.5	06.2	291 15.2	06.7	226 05.0	51.6	93 54.7	122	11 04.8	+101
3	126 46.5	257 02.8	·· 38.2	123 34.8	·· 06.8	306 17.4	·· 06.6	241 07.1	·· 51.7	108 25.9	122	· 11 14.9	+ 99
4	141 49.0	272 02.1	39.1	138 36.2	07.4	321 19.7	06.5	256 09.3	51.7	122 57.1	121	11 24.8	+100
5	156 51.5	287 01.5	39.9	153 37.5	08.0	336 21.9	06.4	271 11.5	51.8	137 28.2	120	11 34.8	+ 99
6	171 53.9	302 00.8	−16 40.8	168 38.8	+ 1 08.5	351 24.1	+ 1 06.3	286 13.6	−19 51.8	151 59.2	120	+11 44.7	+ 98
7	186 56.4	317 00.2	41.6	183 40.1	09.1	6 26.4	06.2	301 15.8	51.9	166 30.2	118	11 54.5	+ 98
8	201 58.8	331 59.5	42.5	198 41.4	09.7	21 28.6	06.1	316 17.9	51.9	181 01.0	118	12 04.3	+ 98
9	217 01.3	346 58.9	·· 43.4	213 42.7	·· 10.3	36 30.8	·· 06.0	331 20.1	·· 51.9	195 31.8	117	· 12 14.1	+ 97
10	232 03.8	1 58.2	44.2	228 44.0	10.9	51 33.1	05.9	346 22.3	52.0	210 02.5	116	12 23.8	+ 96
11	247 06.2	16 57.6	45.1	243 45.3	11.5	66 35.3	05.8	1 24.4	52.0	224 33.1	115	12 33.4	+ 97
12	262 08.7	31 57.0	−16 45.9	258 46.6	+ 1 12.1	81 37.5	+ 1 05.8	16 26.6	−19 52.1	239 03.6	115	+12 43.1	+ 95
13	277 11.2	46 56.3	46.8	273 47.9	12.7	96 39.7	05.7	31 28.7	52.1	253 34.1	113	12 52.6	+ 95
14	292 13.6	61 55.7	47.6	288 49.2	13.3	111 42.0	05.6	46 30.9	52.2	268 04.4	113	13 02.1	+ 95
15	307 16.1	76 55.0	·· 48.5	303 50.5	·· 13.9	126 44.2	·· 05.5	61 33.1	·· 52.2	282 34.7	112	· 13 11.6	+ 94
16	322 18.6	91 54.3	49.3	318 51.8	14.4	141 46.4	05.4	76 35.2	52.3	297 04.9	111	13 21.0	+ 93
17	337 21.0	106 53.7	50.2	333 53.1	15.0	156 48.7	05.3	91 37.4	52.3	311 35.0	110	13 30.3	+ 93
18	352 23.5	121 53.0	−16 51.0	348 54.4	+ 1 15.6	171 50.9	+ 1 05.2	106 39.5	−19 52.4	326 05.0	109	+13 39.6	+ 93
19	7 25.9	136 52.4	51.9	3 55.7	16.2	186 53.1	05.1	121 41.7	52.4	340 34.9	109	13 48.9	+ 91
20	22 28.4	151 51.7	52.7	18 57.0	16.8	201 55.4	05.0	136 43.9	52.5	355 04.8	107	13 58.0	+ 91
21	37 30.9	166 51.1	·· 53.5	33 58.3	·· 17.4	216 57.6	·· 05.0	151 46.0	·· 52.5	9 34.5	107	· 14 07.1	+ 91
22	52 33.3	181 50.4	54.4	48 59.6	18.0	231 59.8	04.9	166 48.2	52.6	24 04.2	106	14 16.2	+ 90
23	67 35.8	196 49.8	55.2	64 00.9	18.6	247 02.1	04.8	181 50.3	52.6	38 33.8	105	14 25.2	+ 89
24	82 38.3	211 49.1	−16 56.1	79 02.2	+ 1 19.2	262 04.3	+ 1 04.7	196 52.5	−19 52.7	53 03.3	104	+14 34.1	+ 89
code	–	− 6	− 8	+ 14	+ 6	+ 23	0	+ 21	− 1				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
11 0	181 42.6	−22 58.9	7	Acamar	315 50.1	−40 28.7
1	196 42.3	59.1	5	Achernar	335 57.9	−57 27.5
2	211 42.0	59.4	30	Acrux	173 56.9	−62 51.4
3	226 41.8	·· 59.6	19	Adhara	255 45.5	−28 54.8
4	241 41.5	22 59.8	10	Aldebaran	291 37.7	+16 25.5
5	256 41.2	23 00.0				
6	271 40.9	−23 00.2	32	Alioth	166 58.1	+56 11.3
7	286 40.6	00.4	34	Alkaid	153 32.6	+49 31.4
8	301 40.3	00.6	55	Al Na'ir	28 37.1	−47 10.3
9	316 40.0	·· 00.8	15	Alnilam	276 29.0	− 1 13.7
10	331 39.7	01.0	25	Alphard	218 37.5	− 8 28.3
11	346 39.5	01.2				
12	1 39.2	−23 01.4	41	Alphecca	126 47.2	+26 51.5
13	16 38.9	01.6	1	Alpheratz	358 27.3	+28 51.4
14	31 38.6	01.8	51	Altair	62 49.8	+ 8 45.4
15	46 38.3	·· 02.0	2	Ankaa	353 57.3	−42 32.5
16	61 38.0	02.2	42	Antares	113 18.6	−26 20.2
17	76 37.7	02.4				
18	91 37.4	−23 02.6	37	Arcturus	146 34.6	+19 24.3
19	106 37.1	02.8	43	Atria	108 59.1	−68 57.0
20	121 36.9	03.0	22	Avior	234 34.9	−59 22.1
21	136 36.6	·· 03.2	13	Bellatrix	279 17.1	+ 6 18.7
22	151 36.3	03.4	16	Betelg'se	271 46.8	+ 7 24.0
23	166 36.0	03.6				
			17	Canopus	264 14.4	−52 40.3
12 0	181 35.7	−23 03.8	12	Capella	281 36.6	+45 57.3
1	196 35.4	04.0	53	Deneb	50 00.7	+45 07.9
2	211 35.1	04.2	28	Denebola	183 16.9	+14 48.6
3	226 34.8	·· 04.3	4	Diphda	349 38.3	−18 13.4
4	241 34.5	04.5				
5	256 34.2	04.7	27	Dubhe	194 43.5	+61 58.6
6	271 33.9	−23 04.9	14	Elnath	279 05.8	+28 34.3
7	286 33.7	05.1	47	Eltanin	91 06.4	+51 29.7
8	301 33.4	05.3	54	Enif	34 28.9	+ 9 40.8
9	316 33.1	·· 05.5	56	Fomalhaut	16 10.7	−29 51.1
10	331 32.8	05.6				
11	346 32.5	05.8	31	Gacrux	172 48.3	−56 52.1
12	1 32.2	−23 06.0	29	Gienah	176 36.0	−17 18.1
13	16 31.9	06.2	35	Hadar	149 48.5	−60 09.8
14	31 31.6	06.4	6	Hamal	328 48.4	+23 15.7
15	46 31.3	·· 06.6	48	Kaus Aust.	84 40.4	−34 24.3
16	61 31.0	06.7				
17	76 30.7	06.9	40	Kochab	137 19.1	+74 19.7
18	91 30.4	−23 07.1	57	Markab	14 20.6	+14 58.6
19	106 30.1	07.3	8	Menkar	314 59.1	+ 3 55.4
20	121 29.9	07.4	36	Menkent	148 57.9	−36 09.4
21	136 29.6	·· 07.6	24	Miapl'dus	221 48.2	−69 32.2
22	151 29.3	07.8				
23	166 29.0	08.0	9	Mirfak	309 40.6	+49 42.7
			50	Nunki	76 51.2	−26 21.0
13 0	181 28.7	−23 08.1	52	Peacock	54 26.4	−56 52.6
1	196 28.4	08.3	21	Pollux	244 19.2	+28 07.7
2	211 28.1	08.5	20	Procyon	245 43.8	+ 5 20.1
3	226 27.8	·· 08.7				
4	241 27.5	08.8	46	R'alhague	96 46.1	+12 35.5
5	256 27.2	09.0	26	Regulus	208 28.5	+12 10.5
6	271 26.9	−23 09.2	11	Rigel	281 52.4	− 8 15.0
7	286 26.6	09.3	38	Rigil Kent.	140 50.2	−60 39.4
8	301 26.3	09.5	44	Sabik	103 01.5	−15 40.3
9	316 26.0	·· 09.7				
10	331 25.7	09.8	3	Schedar	350 28.7	+56 18.5
11	346 25.4	10.0	45	Shaula	97 19.9	−37 04.4
12	1 25.1	−23 10.2	18	Sirius	259 10.7	−16 39.4
13	16 24.8	10.3	33	Spica	159 16.1	−10 56.2
14	31 24.5	10.5	23	Suhail	223 23.4	−43 15.4
15	46 24.3	·· 10.6				
16	61 24.0	10.8	49	Vega	81 08.1	+38 44.7
17	76 23.7	11.0	39	Zub'g'bi	137 52.6	−15 51.8
18	91 23.4	−23 11.1				
19	106 23.1	11.3				
20	121 22.8	11.4				
21	136 22.5	·· 11.6				
22	151 22.2	11.7				
23	166 21.9	11.9				
24	181 21.6	−23 12.1				
code	—	− 2				

Lat.	Sunrise	Twlt. begins	Moonrise 11	12	13	14
N °	h m	h m	h m	h m	h m	h m
72	▬	6 44	11 42	11 28	11 11	10 43
70	▬	6 36	11 48	11 41	11 32	11 23
68	▬	6 29	11 52	11 51	11 49	11 50
66	10 21	6 22	11 56	11 59	12 03	12 11
64	9 42	6 18	12 00	12 06	12 15	12 28
62	9 15	6 12	12 03	12 12	12 25	12 42
60	8 54	6 08	12 05	12 18	12 33	12 53
58	8 37	6 03	12 08	12 23	12 41	13 04
56	8 22	6 00	12 10	12 27	12 47	13 13
54	8 10	5 56	12 12	12 31	12 53	13 21
52	7 59	5 53	12 13	12 34	12 59	13 28
50	7 49	5 49	12 15	12 37	13 03	13 34
45	7 29	5 42	12 18	12 44	13 14	13 48
40	7 13	5 35	12 21	12 50	13 23	14 00
35	6 59	5 28	12 24	12 55	13 30	14 10
30	6 46	5 21	12 26	13 00	13 37	14 19
20	6 26	5 07	12 30	13 08	13 49	14 34
10	6 07	4 52	12 33	13 15	13 59	14 47
0	5 50	4 35	12 36	13 21	14 08	15 00
10	5 33	4 15	12 40	13 28	14 18	15 12
20	5 14	3 50	12 43	13 35	14 29	15 26
30	4 52	3 16	12 47	13 43	14 41	15 41
35	4 40	2 53	12 50	13 47	14 48	15 50
40	4 25	2 23	12 52	13 53	14 56	16 01
45	4 07	1 36	12 55	13 59	15 05	16 13
50	3 45	////	12 59	14 06	15 16	16 28
52	3 34	////	13 01	14 10	15 21	16 35
54	3 22	////	13 03	14 14	15 27	16 42
56	3 08	////	13 05	14 18	15 34	16 51
58	2 52	////	13 07	14 23	15 41	17 01
60	2 32	////	13 10	14 28	15 49	17 12

Lat.	Sunset	Twlt. ends	Moonset 11	12	13	14
N °	h m	h m	h m	h m	h m	h m
72	▬	17 01	0 42	2 28	4 21	6 33
70	▬	17 09	0 39	2 17	4 01	5 55
68	▬	17 16	0 37	2 09	3 46	5 28
66	13 26	17 23	0 34	2 02	3 33	5 08
64	14 06	17 29	0 33	1 56	3 23	4 53
62	14 33	17 34	0 31	1 51	3 14	4 39
60	14 54	17 39	0 30	1 47	3 06	4 28
58	15 11	17 43	0 28	1 43	2 59	4 19
56	15 25	17 46	0 27	1 39	2 54	4 10
54	15 37	17 50	0 26	1 36	2 48	4 03
52	15 48	17 53	0 25	1 34	2 44	3 56
50	15 58	17 57	0 25	1 31	2 39	3 50
45	16 19	18 06	0 23	1 26	2 30	3 37
40	16 35	18 12	0 22	1 21	2 22	3 26
35	16 49	18 19	0 20	1 17	2 16	3 17
30	17 01	18 26	0 19	1 14	2 10	3 09
20	17 22	18 40	0 17	1 08	2 00	2 56
10	17 40	18 55	0 15	1 02	1 52	2 44
0	17 58	19 13	0 14	0 57	1 43	2 32
10	18 15	19 32	0 12	0 53	1 35	2 21
20	18 34	19 58	0 10	0 47	1 27	2 09
30	18 55	20 31	0 08	0 41	1 17	1 56
35	19 08	20 54	0 07	0 38	1 11	1 48
40	19 23	21 25	0 06	0 34	1 05	1 39
45	19 41	22 12	0 05	0 30	0 57	1 29
50	20 03	////	0 03	0 24	0 48	1 16
52	20 14	////	0 02	0 22	0 44	1 11
54	20 26	////	0 01	0 19	0 40	1 04
56	20 40	////	0 00	0 16	0 35	0 57
58	20 56	////	24 13	0 13	0 29	0 49
60	21 16	////	24 09	0 09	0 23	0 40

GMT	Equation of Time (App.—Mean) 11	12	13
h	m s	m s	m s
0	+ 6 51.1	+ 6 23.3	+ 5 55.3
6	+ 6 44.2	+ 6 16.4	+ 5 48.2
12	+ 6 37.2	+ 6 09.4	+ 5 41.1
18	+ 6 30.3	+ 6 02.3	+ 5 34.0
24	+ 6 23.3	+ 5 55.3	+ 5 26.9

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
11	18 47	9 50	18 49	6 41	11 01
12	19 32	9 51	18 46	6 38	10 58
13	20 20	9 52	18 44	6 34	10 54
14	21 12	9 53	18 42	6 31	10 51

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.6	0.1	0.2
30	0.6	0.1	0.1
45	0.6	0.1	0.1
60	0.6	0.0	0.1
75	0.6	0.0	0.0
90			

Moon's Lower Limb Add

Alt.	11	12	13
°	′	′	′
0	13.4	14.4	15.4
4	13.4	14.4	15.4
8	13.4	14.4	15.4
12	13.4	14.4	15.4
16	13.5	14.4	15.4
20	13.5	14.5	15.4
24	13.6	14.5	15.4
28	13.6	14.5	15.4
32	13.7	14.6	15.4
36	13.7	14.6	15.4
40	13.8	14.6	15.4
44	13.9	14.7	15.5
48	14.0	14.7	15.5
52	14.1	14.8	15.5
56	14.2	14.8	15.5
60	14.3	14.9	15.5
64	14.4	14.9	15.5
68	14.5	15.0	15.5
72	14.6	15.1	15.5
76	14.7	15.1	15.5
80	14.9	15.2	15.5
84	15.0	15.2	15.5
88	15.1	15.3	15.5
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt.	11	12	13
°	′	′	′
0	16.8	16.2	15.6
4	16.8	16.2	15.6
8	16.8	16.2	15.6
12	16.7	16.2	15.6
16	16.7	16.2	15.6
20	16.7	16.1	15.6
24	16.6	16.1	15.6
28	16.6	16.1	15.6
32	16.5	16.1	15.6
36	16.4	16.0	15.6
40	16.4	16.0	15.6
44	16.3	15.9	15.6
48	16.2	15.9	15.6
52	16.1	15.8	15.6
56	16.0	15.8	15.6
60	15.9	15.7	15.6
64	15.8	15.7	15.6
68	15.7	15.6	15.6
72	15.6	15.6	15.6
76	15.4	15.5	15.5
80	15.3	15.4	15.5
84	15.2	15.4	15.5
88	15.1	15.3	15.5
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.4 GHA	VENUS −3.4 Dec	MARS −0.1 GHA	MARS −0.1 Dec	JUPITER −1.6 GHA	JUPITER −1.6 Dec	SATURN 0.7 GHA	SATURN 0.7 Dec	MOON GHA	MOON code	MOON Dec	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
14 0	82 38.3	211 49.1	−16 56.1	79 02.2	+ 1 19.2	262 04.3	+ 1 04.7	196 52.5	−19 52.7	53 03.3	104	+14 34.1	+ 89
1	97 40.7	226 48.5	56.9	94 03.5	19.8	277 06.5	04.6	211 54.7	52.7	67 32.7	103	14 43.0	+ 88
2	112 43.2	241 47.8	57.8	109 04.7	20.4	292 08.8	04.5	226 56.8	52.8	82 02.0	102	14 51.8	+ 87
3	127 45.7	256 47.1	·· 58.6	124 06.0	·· 20.9	307 11.0	·· 04.4	241 59.0	·· 52.8	96 31.2	101	·15 00.5	+ 87
4	142 48.1	271 46.5	16 59.4	139 07.3	21.5	322 13.2	04.3	257 01.1	52.9	111 00.3	100	15 09.2	+ 86
5	157 50.6	286 45.8	17 00.3	154 08.6	22.1	337 15.5	04.2	272 03.3	52.9	125 29.3	100	15 17.8	+ 85
6	172 53.1	301 45.2	−17 01.1	169 09.9	+ 1 22.7	352 17.7	+ 1 04.2	287 05.5	−19 53.0	139 58.3	98	+15 26.3	+ 84
7	187 55.5	316 44.5	02.0	184 11.2	23.3	7 19.9	04.1	302 07.6	53.0	154 27.1	98	15 34.7	+ 84
8	202 58.0	331 43.9	02.8	199 12.5	23.9	22 22.2	04.0	317 09.8	53.0	168 55.9	96	15 43.1	+ 83
9	218 00.4	346 43.2	·· 03.6	214 13.8	·· 24.5	37 24.4	·· 03.9	332 11.9	·· 53.1	183 24.5	96	·15 51.4	+ 82
10	233 02.9	1 42.5	04.5	229 15.1	25.1	52 26.6	03.8	347 14.1	53.1	197 53.1	95	15 59.6	+ 82
11	248 05.4	16 41.9	05.3	244 16.4	25.7	67 28.9	03.7	2 16.3	53.2	212 21.6	93	16 07.8	+ 81
12	263 07.8	31 41.2	−17 06.1	259 17.7	+ 1 26.3	82 31.1	+ 1 03.6	17 18.4	−19 53.2	226 49.9	93	+16 15.9	+ 79
13	278 10.3	46 40.5	07.0	274 19.0	26.9	97 33.4	03.5	32 20.6	53.3	241 18.2	92	16 23.8	+ 79
14	293 12.8	61 39.9	07.8	289 20.3	27.4	112 35.6	03.5	47 22.7	53.3	255 46.4	91	16 31.7	+ 79
15	308 15.2	76 39.2	·· 08.6	304 21.6	·· 28.0	127 37.8	·· 03.4	62 24.9	·· 53.4	270 14.5	90	·16 39.6	+ 77
16	323 17.7	91 38.6	09.5	319 22.9	28.6	142 40.1	03.3	77 27.1	53.4	284 42.5	89	16 47.3	+ 77
17	338 20.2	106 37.9	10.3	334 24.1	29.2	157 42.3	03.2	92 29.2	53.5	299 10.4	88	16 55.0	+ 75
18	353 22.6	121 37.2	−17 11.1	349 25.4	+ 1 29.8	172 44.5	+ 1 03.1	107 31.4	−19 53.5	313 38.2	88	+17 02.5	+ 75
19	8 25.1	136 36.6	12.0	4 26.7	30.4	187 46.8	03.0	122 33.5	53.6	328 06.0	86	17 10.0	+ 74
20	23 27.6	151 35.9	12.8	19 28.0	31.0	202 49.0	02.9	137 35.7	53.6	342 33.6	85	17 17.4	+ 73
21	38 30.0	166 35.2	·· 13.6	34 29.3	·· 31.6	217 51.3	·· 02.8	152 37.9	·· 53.7	357 01.1	85	·17 24.7	+ 72
22	53 32.5	181 34.6	14.4	49 30.6	32.2	232 53.5	02.8	167 40.0	53.7	11 28.6	83	17 31.9	+ 72
23	68 34.9	196 33.9	15.3	64 31.9	32.8	247 55.7	02.7	182 42.2	53.8	25 55.9	82	17 39.1	+ 70
15 0	83 37.4	211 33.2	−17 16.1	79 33.2	+ 1 33.4	262 58.0	+ 1 02.6	197 44.3	−19 53.8	40 23.1	82	+17 46.1	+ 69
1	98 39.9	226 32.6	16.9	94 34.5	34.0	278 00.2	02.5	212 46.5	53.9	54 50.3	81	17 53.0	+ 68
2	113 42.3	241 31.9	17.7	109 35.8	34.6	293 02.5	02.4	227 48.7	53.9	69 17.4	79	17 59.8	+ 68
3	128 44.8	256 31.2	·· 18.6	124 37.0	·· 35.1	308 04.7	·· 02.3	242 50.8	·· 54.0	83 44.3	79	·18 06.6	+ 66
4	143 47.3	271 30.5	19.4	139 38.3	35.7	323 06.9	02.2	257 53.0	54.0	98 11.2	78	18 13.2	+ 65
5	158 49.7	286 29.9	20.2	154 39.6	36.3	338 09.2	02.2	272 55.1	54.0	112 38.0	77	18 19.7	+ 65
6	173 52.2	301 29.2	−17 21.0	169 40.9	+ 1 36.9	353 11.4	+ 1 02.1	287 57.3	−19 54.1	127 04.7	76	+18 26.2	+ 63
7	188 54.7	316 28.5	21.8	184 42.2	37.5	8 13.7	02.0	302 59.5	54.1	141 31.3	75	18 32.5	+ 62
8	203 57.1	331 27.9	22.7	199 43.5	38.1	23 15.9	01.9	318 01.6	54.2	155 57.8	74	18 38.7	+ 62
9	218 59.6	346 27.2	·· 23.5	214 44.8	·· 38.7	38 18.1	·· 01.8	333 03.8	·· 54.2	170 24.2	73	·18 44.9	+ 60
10	234 02.0	1 26.5	24.3	229 46.0	39.3	53 20.4	01.7	348 05.9	54.3	184 50.5	72	18 50.9	+ 59
11	249 04.5	16 25.8	25.1	244 47.3	39.9	68 22.6	01.6	3 08.1	54.3	199 16.7	72	18 56.8	+ 58
12	264 07.0	31 25.2	−17 25.9	259 48.6	+ 1 40.5	83 24.9	+ 1 01.6	18 10.3	−19 54.4	213 42.9	70	+19 02.6	+ 56
13	279 09.4	46 24.5	26.7	274 49.9	41.1	98 27.1	01.5	33 12.4	54.4	228 08.9	70	19 08.2	+ 56
14	294 11.9	61 23.8	27.6	289 51.2	41.7	113 29.4	01.4	48 14.6	54.5	242 34.9	69	19 13.8	+ 55
15	309 14.4	76 23.1	·· 28.4	304 52.5	·· 42.3	128 31.6	·· 01.3	63 16.8	·· 54.5	257 00.8	68	·19 19.3	+ 53
16	324 16.8	91 22.5	29.2	319 53.7	42.9	143 33.8	01.2	78 18.9	54.6	271 26.6	67	19 24.6	+ 52
17	339 19.3	106 21.8	30.0	334 55.0	43.5	158 36.1	01.1	93 21.1	54.6	285 52.3	66	19 29.8	+ 52
18	354 21.8	121 21.1	−17 30.8	349 56.3	+ 1 44.0	173 38.3	+ 1 01.1	108 23.2	−19 54.7	300 17.9	65	+19 35.0	+ 49
19	9 24.2	136 20.4	31.6	4 57.6	44.6	188 40.6	01.0	123 25.4	54.7	314 43.4	65	19 39.9	+ 49
20	24 26.7	151 19.8	32.4	19 58.9	45.2	203 42.8	00.9	138 27.6	54.8	329 08.9	63	19 44.8	+ 48
21	39 29.2	166 19.1	·· 33.2	35 00.2	·· 45.8	218 45.1	·· 00.8	153 29.7	·· 54.8	343 34.2	63	·19 49.6	+ 46
22	54 31.6	181 18.4	34.0	50 01.4	46.4	233 47.3	00.7	168 31.9	54.8	357 59.5	62	19 54.2	+ 45
23	69 34.1	196 17.7	34.8	65 02.7	47.0	248 49.6	00.6	183 34.0	54.9	12 24.7	61	19 58.7	+ 44
16 0	84 36.5	211 17.0	−17 35.7	80 04.0	+ 1 47.6	263 51.8	+ 1 00.6	198 36.2	−19 54.9	26 49.8	61	+20 03.1	+ 42
1	99 39.0	226 16.4	36.5	95 05.3	48.2	278 54.0	00.5	213 38.4	55.0	41 14.9	59	20 07.3	+ 42
2	114 41.5	241 15.7	37.3	110 06.6	48.8	293 56.3	00.4	228 40.5	55.0	55 39.8	59	20 11.5	+ 40
3	129 43.9	256 15.0	·· 38.1	125 07.8	·· 49.4	308 58.5	·· 00.3	243 42.7	·· 55.1	70 04.7	58	·20 15.5	+ 38
4	144 46.4	271 14.3	38.9	140 09.1	50.0	324 00.8	00.2	258 44.8	55.1	84 29.5	58	20 19.3	+ 38
5	159 48.9	286 13.6	39.7	155 10.4	50.6	339 03.0	00.1	273 47.0	55.2	98 54.3	56	20 23.1	+ 36
6	174 51.3	301 12.9	−17 40.5	170 11.7	+ 1 51.2	354 05.3	+ 1 00.1	288 49.2	−19 55.2	113 18.9	56	+20 26.7	+ 35
7	189 53.8	316 12.3	41.3	185 13.0	51.8	9 07.5	1 00.0	303 51.3	55.3	127 43.5	55	20 30.2	+ 33
8	204 56.3	331 11.6	42.1	200 14.2	52.4	24 09.8	0 59.9	318 53.5	55.3	142 08.0	55	20 33.5	+ 32
9	219 58.7	346 10.9	·· 42.9	215 15.5	·· 53.0	39 12.0	·· 59.8	333 55.7	·· 55.4	156 32.5	54	·20 36.7	+ 31
10	235 01.2	1 10.2	43.7	230 16.8	53.5	54 14.3	59.7	348 57.8	55.4	170 56.9	53	20 39.8	+ 29
11	250 03.7	16 09.5	44.5	245 18.1	54.1	69 16.5	59.6	4 00.0	55.5	185 21.2	52	20 42.7	+ 28
12	265 06.1	31 08.8	−17 45.3	260 19.3	+ 1 54.7	84 18.8	+ 0 59.6	19 02.1	−19 55.5	199 45.4	52	+20 45.5	+ 27
13	280 08.6	46 08.2	46.1	275 20.6	55.3	99 21.0	59.5	34 04.3	55.5	214 09.6	51	20 48.2	+ 25
14	295 11.0	61 07.5	46.9	290 21.9	55.9	114 23.3	59.4	49 06.5	55.6	228 33.7	51	20 50.7	+ 24
15	310 13.5	76 06.8	·· 47.6	305 23.2	·· 56.5	129 25.5	·· 59.3	64 08.6	·· 55.6	242 57.8	50	·20 53.1	+ 23
16	325 16.0	91 06.1	48.4	320 24.4	57.1	144 27.8	59.2	79 10.8	55.7	257 21.8	49	20 55.4	+ 21
17	340 18.4	106 05.4	49.2	335 25.7	57.7	159 30.0	59.2	94 13.0	55.7	271 45.7	49	20 57.5	+ 19
18	355 20.9	121 04.7	−17 50.0	350 27.0	+ 1 58.3	174 32.3	+ 0 59.1	109 15.1	−19 55.8	286 09.6	48	+20 59.4	+ 18
19	10 23.4	136 04.0	50.8	5 28.3	58.9	189 34.5	59.0	124 17.3	55.8	300 33.4	48	21 01.2	+ 17
20	25 25.8	151 03.3	51.6	20 29.5	1 59.5	204 36.8	58.9	139 19.4	55.9	314 57.2	47	21 02.9	+ 16
21	40 28.3	166 02.6	·· 52.4	35 30.8	· 2 00.1	219 39.0	·· 58.8	154 21.6	·· 55.9	329 20.9	47	·21 04.5	+ 13
22	55 30.8	181 01.9	53.2	50 32.1	00.7	234 41.3	58.7	169 23.8	56.0	343 44.6	46	21 05.8	+ 13
23	70 33.2	196 01.3	54.0	65 33.4	01.3	249 43.5	58.7	184 25.9	56.0	358 08.2	46	21 07.1	+ 11
24	85 35.7	211 00.6	−17 54.8	80 34.6	+ 2 01.9	264 45.8	+ 0 58.6	199 28.1	−19 56.1	12 31.8	45	+21 08.2	+ 9
code	—	− 7	− 8	+ 13	+ 6	+ 22	− 1	+ 21	0				

GMT	SUN GHA	SUN Dec.
h	° ′	° ′
14 00	181 21.6	−23 12.1
01	196 21.3	12.2
02	211 21.0	12.4
03	226 20.7	12.5
04	241 20.4	12.7
05	256 20.1	12.8
06	271 19.8	−23 13.0
07	286 19.5	13.1
08	301 19.2	13.3
09	316 18.9	13.4
10	331 18.6	13.6
11	346 18.3	13.7
12	1 18.0	−23 13.8
13	16 17.7	14.0
14	31 17.4	14.1
15	46 17.1	14.3
16	61 16.8	14.4
17	76 16.5	14.5
18	91 16.2	−23 14.7
19	106 15.9	14.8
20	121 15.6	15.0
21	136 15.3	15.1
22	151 15.0	15.2
23	166 14.7	15.4
15 00	181 14.4	−23 15.5
01	196 14.1	15.6
02	211 13.8	15.8
03	226 13.5	15.9
04	241 13.2	16.0
05	256 12.9	16.2
06	271 12.6	−23 16.3
07	286 12.3	16.4
08	301 12.0	16.6
09	316 11.7	16.7
10	331 11.4	16.8
11	346 11.1	16.9
12	1 10.8	−23 17.1
13	16 10.5	17.2
14	31 10.2	17.3
15	46 09.9	17.4
16	61 09.6	17.6
17	76 09.3	17.7
18	91 09.0	−23 17.8
19	106 08.7	17.9
20	121 08.4	18.0
21	136 08.1	18.2
22	151 07.8	18.3
23	166 07.5	18.4
16 00	181 07.2	−23 18.5
01	196 06.9	18.6
02	211 06.6	18.7
03	226 06.3	18.8
04	241 06.0	19.0
05	256 05.7	19.1
06	271 05.4	−23 19.2
07	286 05.1	19.3
08	301 04.8	19.4
09	316 04.5	19.5
10	331 04.2	19.6
11	346 03.9	19.7
12	1 03.6	−23 19.8
13	16 03.3	19.9
14	31 03.0	20.0
15	46 02.6	20.1
16	61 02.3	20.2
17	76 02.0	20.3
18	91 01.7	−23 20.4
19	106 01.4	20.5
20	121 01.1	20.6
21	136 00.8	20.7
22	151 00.5	20.8
23	166 00.2	20.9
24	180 59.9	−23 21.0
code	—	− 1

STARS No.	Name	SHA ° ′	Dec. ° ′
7	Acamar	315 50.1	−40 28.7
5	Achernar	335 57.9	−57 27.5
30	Acrux	173 56.9	−62 51.4
19	Adhara	255 45.5	−28 54.8
10	Aldebaran	291 37.7	+16 25.5
32	Alioth	166 58.0	+56 11.3
34	Alkaid	153 32.5	+49 31.4
55	Al Na'ir	28 37.1	−47 10.3
15	Alnilam	276 29.0	− 1 13.7
25	Alphard	218 37.5	− 8 28.3
41	Alphecca	126 47.2	+26 51.5
1	Alpheratz	358 27.3	+28 51.4
51	Altair	62 49.8	+ 8 45.4
2	Ankaa	353 57.4	−42 32.5
42	Antares	113 18.6	−26 20.2
37	Arcturus	146 34.6	+19 24.2
43	Atria	108 59.1	−68 57.0
22	Avior	234 34.8	−59 22.1
13	Bellatrix	279 17.1	+ 6 18.7
16	Betelg'se	271 46.8	+ 7 24.0
17	Canopus	264 14.4	−52 40.3
12	Capella	281 36.6	+45 57.4
53	Deneb	50 00.7	+45 07.9
28	Denebola	183 16.9	+14 48.6
4	Diphda	349 38.3	−18 13.4
27	Dubhe	194 43.5	+61 58.6
14	Elnath	279 05.8	+28 34.3
47	Eltanin	91 06.4	+51 29.7
54	Enif	34 28.9	+ 9 40.8
56	Fomalhaut	16 10.7	−29 51.1
31	Gacrux	172 48.3	−56 52.1
29	Gienah	176 36.0	−17 18.2
35	Hadar	149 48.5	−60 09.8
6	Hamal	328 48.4	+23 15.7
48	Kaus Aust.	84 40.4	−34 24.3
40	Kochab	137 19.1	+74 19.7
57	Markab	14 20.6	+14 58.6
8	Menkar	314 59.1	+ 3 55.4
36	Menkent	148 57.8	−36 09.4
24	Miapl'dus	221 48.1	−69 32.2
9	Mirfak	309 40.6	+49 42.7
50	Nunki	76 51.2	−26 21.0
52	Peacock	54 26.4	−56 52.5
21	Pollux	244 19.2	+28 07.7
20	Procyon	245 43.8	+ 5 20.1
46	R'alhague	96 46.1	+12 35.5
26	Regulus	208 28.4	+12 10.5
11	Rigel	281 52.4	− 8 15.1
38	Rigil Kent.	140 50.1	−60 39.4
44	Sabik	103 01.5	−15 40.3
3	Schedar	350 28.7	+56 18.5
45	Shaula	97 19.9	−37 04.4
18	Sirius	259 10.7	−16 39.4
33	Spica	159 16.1	−10 56.2
23	Suhail	223 23.3	−43 15.4
49	Vega	81 08.1	+38 44.7
39	Zub'g'bi	137 52.6	−15 51.8

Lat. N °	Sunrise h m	Twlt. begins h m
72	▬	6 48
70	▬	6 40
68	▬	6 33
66	10 27	6 26
64	9 46	6 21
62	9 19	6 15
60	8 57	6 11
58	8 40	6 07
56	8 25	6 02
54	8 13	5 59
52	8 02	5 55
50	7 52	5 52
45	7 31	5 44
40	7 15	5 37
35	7 01	5 29
30	6 48	5 23
20	6 27	5 08
10	6 09	4 53
0	5 52	4 36
10	5 34	4 16
20	5 15	3 51
30	4 53	3 17
35	4 40	2 53
40	4 25	2 22
45	4 08	1 35
50	3 45	////
52	3 34	////
54	3 22	////
56	3 08	////
58	2 52	////
60	2 31	////
S		

Moonrise	14	15	16	17
Lat. N °	h m	h m	h m	h m
72	10 43	□	□	□
70	11 23	11 06	□	□
68	11 50	11 54	12 07	12 54
66	12 11	12 25	12 52	13 46
64	12 28	12 48	13 22	14 18
62	12 42	13 06	13 44	14 42
60	12 53	13 22	14 03	15 01
58	13 04	13 35	14 18	15 17
56	13 13	13 46	14 31	15 30
54	13 21	13 56	14 42	15 41
52	13 28	14 05	14 52	15 52
50	13 34	14 13	15 01	16 01
45	13 48	14 30	15 20	16 20
40	14 00	14 44	15 36	16 36
35	14 10	14 56	15 49	16 49
30	14 19	15 06	16 00	17 01
20	14 34	15 24	16 20	17 21
10	14 47	15 40	16 37	17 38
0	15 00	15 55	16 53	17 55
10	15 12	16 10	17 10	18 11
20	15 26	16 25	17 27	18 28
30	15 41	16 44	17 47	18 48
35	15 50	16 54	17 59	19 00
40	16 01	17 07	18 12	19 13
45	16 13	17 21	18 28	19 29
50	16 28	17 39	18 48	19 48
52	16 35	17 48	18 57	19 58
54	16 42	17 57	19 07	20 08
56	16 51	18 08	19 19	20 20
58	17 01	18 20	19 33	20 33
60	17 12	18 34	19 49	20 49

Lat. N °	Sunset h m	Twlt. ends h m
72	▬	17 00
70	▬	17 09
68	▬	17 16
66	13 23	17 23
64	14 04	17 29
62	14 32	17 34
60	14 53	17 38
58	15 10	17 43
56	15 25	17 47
54	15 38	17 51
52	15 49	17 55
50	15 58	17 57
45	16 19	18 06
40	16 36	18 14
35	16 50	18 21
30	17 02	18 27
20	17 23	18 42
10	17 42	18 57
0	17 59	19 14
10	18 16	19 34
20	18 35	19 59
30	18 57	20 33
35	19 10	20 57
40	19 25	21 28
45	19 43	22 15
50	20 05	////
52	20 16	////
54	20 28	////
56	20 43	////
58	20 59	////
60	21 19	////
S		

Moonset	14	15	16	17
Lat. N °	h m	h m	h m	h m
72	6 33	□	□	□
70	5 55	8 04	□	□
68	5 28	7 17	9 04	10 24
66	5 08	6 46	8 19	9 32
64	4 53	6 24	7 50	9 00
62	4 39	6 06	7 27	8 36
60	4 28	5 51	7 09	8 17
58	4 19	5 38	6 54	8 01
56	4 10	5 27	6 42	7 48
54	4 03	5 18	6 30	7 36
52	3 56	5 09	6 20	7 26
50	3 50	5 02	6 12	7 16
45	3 37	4 45	5 53	6 57
40	3 26	4 32	5 38	6 41
35	3 17	4 21	5 25	6 28
30	3 09	4 11	5 14	6 16
20	2 56	3 54	4 55	5 56
10	2 44	3 39	4 38	5 39
0	2 32	3 25	4 22	5 22
10	2 21	3 12	4 07	5 06
20	2 09	2 57	3 50	4 48
30	1 56	2 40	3 31	4 28
35	1 48	2 30	3 20	4 16
40	1 39	2 19	3 07	4 03
45	1 29	2 06	2 52	3 47
50	1 16	1 51	2 33	3 27
52	1 11	1 43	2 25	3 18
54	1 04	1 35	2 15	3 07
56	0 57	1 26	2 04	2 55
58	0 49	1 15	1 51	2 42
60	0 40	1 03	1 37	2 25

ADDITIONAL ALTITUDE CORRECTIONS

Alt. °	Sun's Low'r Limb Add ′	Venus Add ′	Mars Add ′
0	0.6	0.1	0.2
30	0.6	0.1	0.1
45	0.6	0.1	0.1
60	0.6	0.0	0.1
75	0.6	0.0	0.0
90			

Moon's Lower Limb Add

Alt. °	14 ′	15 ′	16 ′
0	16.6	17.7	18.7
4	16.6	17.7	18.7
8	16.6	17.7	18.7
12	16.5	17.7	18.7
16	16.5	17.6	18.6
20	16.5	17.6	18.6
24	16.5	17.5	18.5
28	16.5	17.5	18.4
32	16.4	17.4	18.3
36	16.4	17.4	18.2
40	16.4	17.3	18.1
44	16.3	17.2	18.0
48	16.3	17.1	17.8
52	16.2	17.0	17.7
56	16.2	16.9	17.6
60	16.1	16.8	17.4
64	16.1	16.7	17.2
68	16.0	16.6	17.1
72	16.0	16.5	16.9
76	15.9	16.4	16.8
80	15.9	16.3	16.6
84	15.8	16.1	16.4
88	15.8	16.0	16.3
90			

Add to table, back cover

Moon's Upper Limb Subtract

Alt. °	14 ′	15 ′	16 ′
0	15.0	14.3	13.7
4	15.0	14.3	13.7
8	15.0	14.3	13.8
12	15.0	14.4	13.8
16	15.0	14.4	13.9
20	15.0	14.4	13.9
24	15.0	14.5	14.0
28	15.1	14.5	14.1
32	15.1	14.6	14.2
36	15.1	14.7	14.3
40	15.2	14.8	14.4
44	15.2	14.8	14.5
48	15.3	14.9	14.6
52	15.3	15.0	14.8
56	15.3	15.1	14.9
60	15.4	15.2	15.1
64	15.4	15.3	15.2
68	15.5	15.4	15.4
72	15.5	15.5	15.5
76	15.6	15.7	15.7
80	15.7	15.8	15.9
84	15.7	15.9	16.1
88	15.8	16.0	16.2
90			

Subtract from table, back cover

GMT	Equation of Time (App.—Mean) 14	15	16
h	m s	m s	m s
0	+ 5 26.9	+ 4 58.3	+ 4 29.4
6	+ 5 19.8	+ 4 51.1	+ 4 22.1
12	+ 5 12.6	+ 4 43.9	+ 4 14.8
18	+ 5 05.5	+ 4 36.6	+ 4 07.6
24	+ 4 58.3	+ 4 29.4	+ 4 00.3

GMT of Transit Meridian of Greenwich DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
14	21 12	9 53	18 42	6 31	10 51
15	22 08	9 54	18 40	6 27	10 48
16	23 08	9 55	18 38	6 24	10 44
17	24 09	9 56	18 36	6 20	10 41

GMT	♈ GHA	VENUS −3.4 GHA	VENUS −3.4 Dec.	MARS 0.0 GHA	MARS 0.0 Dec.	JUPITER −1.6 GHA	JUPITER −1.6 Dec.	SATURN 0.7 GHA	SATURN 0.7 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
17 0	85 35.7	211 00.6	−17 54.8	80 34.6	+ 2 01.9	264 45.8	+ 0 58.6	199 28.1	−19 56.1	12 31.8	45	+21 08.2	+ 9
1	100 38.2	225 59.9	55.5	95 35.9	02.5	279 48.0	58.5	214 30.2	56.1	26 55.3	45	21 09.1	+ 8
2	115 40.6	240 59.2	56.3	110 37.2	03.1	294 50.3	58.4	229 32.4	56.2	41 18.8	44	21 09.9	+ 7
3	130 43.1	255 58.5	·· 57.1	125 38.5	·· 03.7	309 52.5	·· 58.3	244 34.6	·· 56.2	55 42.2	45	·21 10.6	+ 5
4	145 45.5	270 57.8	57.9	140 39.7	04.3	324 54.8	58.3	259 36.7	56.2	70 05.7	43	21 11.1	+ 3
5	160 48.0	285 57.1	58.7	155 41.0	04.9	339 57.0	58.2	274 38.9	56.3	84 29.0	43	21 11.4	+ 2
6	175 50.5	300 56.4	−17 59.5	170 42.3	+ 2 05.5	354 59.3	+ 0 58.1	289 41.1	−19 56.3	98 52.3	43	+21 11.6	+ 1
7	190 52.9	315 55.7	18 00.2	185 43.5	06.0	10 01.5	58.0	304 43.2	56.4	113 15.6	43	21 11.7	− 1
8	205 55.4	330 55.0	01.0	200 44.8	06.6	25 03.8	57.9	319 45.4	56.4	127 38.9	42	21 11.6	− 2
9	220 57.9	345 54.3	·· 01.8	215 46.1	·· 07.2	40 06.0	·· 57.9	334 47.5	·· 56.5	142 02.1	42	·21 11.4	− 4
10	236 00.3	0 53.6	02.6	230 47.3	07.8	55 08.3	57.8	349 49.7	56.5	156 25.3	42	21 11.0	− 6
11	251 02.8	15 52.9	03.4	245 48.6	08.4	70 10.5	57.7	4 51.9	56.6	170 48.5	42	21 10.4	− 7
12	266 05.3	30 52.2	−18 04.1	260 49.9	+ 2 09.0	85 12.8	+ 0 57.6	19 54.0	−19 56.6	185 11.7	41	+21 09.7	− 8
13	281 07.7	45 51.5	04.9	275 51.2	09.6	100 15.0	57.5	34 56.2	56.7	199 34.8	41	21 08.9	− 10
14	296 10.2	60 50.8	05.7	290 52.4	10.2	115 17.3	57.5	49 58.4	56.7	213 57.9	41	21 07.9	− 12
15	311 12.7	75 50.1	·· 06.5	305 53.7	·· 10.8	130 19.6	·· 57.4	65 00.5	·· 56.8	228 21.0	41	·21 06.7	− 13
16	326 15.1	90 49.4	07.2	320 55.0	11.4	145 21.8	57.3	80 02.7	56.8	242 44.1	40	21 05.4	− 15
17	341 17.6	105 48.7	08.0	335 56.2	12.0	160 24.1	57.2	95 04.8	56.8	257 07.1	41	21 03.9	− 16
18	356 20.0	120 48.0	−18 08.8	350 57.5	+ 2 12.6	175 26.3	+ 0 57.1	110 07.0	−19 56.9	271 30.2	40	+21 02.3	− 17
19	11 22.5	135 47.3	09.6	5 58.8	13.2	190 28.6	57.1	125 09.2	56.9	285 53.2	40	21 00.6	− 20
20	26 25.0	150 46.6	10.3	21 00.0	13.8	205 30.8	57.0	140 11.3	57.0	300 16.2	41	20 58.6	− 20
21	41 27.4	165 45.9	·· 11.1	36 01.3	·· 14.4	220 33.1	·· 56.9	155 13.5	·· 57.0	314 39.3	40	·20 56.6	− 23
22	56 29.9	180 45.2	11.9	51 02.6	15.0	235 35.4	56.8	170 15.7	57.1	329 02.3	40	20 54.3	− 23
23	71 32.4	195 44.5	12.6	66 03.8	15.6	250 37.6	56.8	185 17.8	57.1	343 25.3	40	20 52.0	− 26
18 0	86 34.8	210 43.8	−18 13.4	81 05.1	+ 2 16.2	265 39.9	+ 0 56.7	200 20.0	−19 57.2	357 48.3	40	+20 49.4	− 26
1	101 37.3	225 43.1	14.2	96 06.4	16.8	280 42.1	56.6	215 22.2	57.2	12 11.3	40	20 46.8	− 29
2	116 39.8	240 42.4	14.9	111 07.6	17.4	295 44.4	56.5	230 24.3	57.3	26 34.3	40	20 43.9	− 29
3	131 42.2	255 41.7	·· 15.7	126 08.9	·· 18.0	310 46.6	·· 56.4	245 26.5	·· 57.3	40 57.3	40	·20 41.0	− 32
4	146 44.7	270 41.0	16.5	141 10.1	18.6	325 48.9	56.4	260 28.6	57.4	55 20.3	41	20 37.8	− 33
5	161 47.1	285 40.2	17.2	156 11.4	19.2	340 51.2	56.3	275 30.8	57.4	69 43.4	40	20 34.5	− 34
6	176 49.6	300 39.5	−18 18.0	171 12.7	+ 2 19.8	355 53.4	+ 0 56.2	290 33.0	−19 57.4	84 06.4	40	+20 31.1	− 36
7	191 52.1	315 38.8	18.7	186 13.9	20.4	10 55.7	56.1	305 35.1	57.5	98 29.4	41	20 27.5	− 37
8	206 54.5	330 38.1	19.5	201 15.2	21.0	25 57.9	56.1	320 37.3	57.5	112 52.5	41	20 23.8	− 39
9	221 57.0	345 37.4	·· 20.3	216 16.5	·· 21.6	41 00.2	·· 56.0	335 39.5	·· 57.6	127 15.6	41	·20 19.9	− 40
10	236 59.5	0 36.7	21.0	231 17.7	22.2	56 02.5	55.9	350 41.6	57.6	141 38.7	41	20 15.9	− 42
11	252 01.9	15 36.0	21.8	246 19.0	22.7	71 04.7	55.8	5 43.8	57.7	156 01.8	41	20 11.7	− 43
12	267 04.4	30 35.3	−18 22.5	261 20.2	+ 2 23.3	86 07.0	+ 0 55.8	20 45.9	−19 57.7	170 24.9	42	+20 07.4	− 45
13	282 06.9	45 34.6	23.3	276 21.5	23.9	101 09.2	55.7	35 48.1	57.8	184 48.1	42	20 02.9	− 46
14	297 09.3	60 33.9	24.1	291 22.8	24.5	116 11.5	55.6	50 50.3	57.8	199 11.3	42	19 58.3	− 48
15	312 11.8	75 33.1	·· 24.8	306 24.0	·· 25.1	131 13.8	·· 55.5	65 52.4	·· 57.9	213 34.5	42	·19 53.5	− 49
16	327 14.3	90 32.4	25.6	321 25.3	25.7	146 16.0	55.4	80 54.6	57.9	227 57.7	43	19 48.6	− 50
17	342 16.7	105 31.7	26.3	336 26.5	26.3	161 18.3	55.4	95 56.8	57.9	242 21.0	43	19 43.6	− 52
18	357 19.2	120 31.0	−18 27.1	351 27.8	+ 2 26.9	176 20.5	+ 0 55.3	110 58.9	−19 58.0	256 44.3	43	+19 38.4	− 53
19	12 21.6	135 30.3	27.8	6 29.1	27.5	191 22.8	55.2	126 01.1	58.0	271 07.6	44	19 33.1	− 55
20	27 24.1	150 29.6	28.6	21 30.3	28.1	206 25.1	55.1	141 03.3	58.1	285 31.0	44	19 27.6	− 56
21	42 26.6	165 28.9	·· 29.3	36 31.6	·· 28.7	221 27.3	·· 55.1	156 05.4	·· 58.1	299 54.4	44	·19 22.0	− 58
22	57 29.0	180 28.1	30.1	51 32.8	29.3	236 29.6	55.0	171 07.6	58.2	314 17.8	45	19 16.2	− 59
23	72 31.5	195 27.4	30.8	66 34.1	29.9	251 31.9	54.9	186 09.7	58.2	328 41.3	45	19 10.3	− 60
19 0	87 34.0	210 26.7	−18 31.6	81 35.4	+ 2 30.5	266 34.1	+ 0 54.8	201 11.9	−19 58.3	343 04.8	45	+19 04.3	− 62
1	102 36.4	225 26.0	32.3	96 36.6	31.1	281 36.4	54.8	216 14.1	58.3	357 28.3	46	18 58.1	− 63
2	117 38.9	240 25.3	33.1	111 37.9	31.7	296 38.6	54.7	231 16.2	58.4	11 51.9	47	18 51.8	− 64
3	132 41.4	255 24.6	·· 33.8	126 39.1	·· 32.3	311 40.9	·· 54.6	246 18.4	·· 58.4	26 15.6	47	·18 45.4	− 66
4	147 43.8	270 23.8	34.5	141 40.4	32.9	326 43.2	54.5	261 20.6	58.4	40 39.3	47	18 38.8	− 67
5	162 46.3	285 23.1	35.3	156 41.6	33.5	341 45.4	54.5	276 22.7	58.5	55 03.0	48	18 32.1	− 69
6	177 48.7	300 22.4	−18 36.0	171 42.9	+ 2 34.1	356 47.7	+ 0 54.4	291 24.9	−19 58.5	69 26.8	48	+18 25.2	− 69
7	192 51.2	315 21.7	36.8	186 44.1	34.7	11 50.0	54.3	306 27.1	58.6	83 50.6	49	18 18.3	− 71
8	207 53.7	330 20.9	37.5	201 45.4	35.3	26 52.2	54.2	321 29.2	58.6	98 14.5	49	18 11.2	− 73
9	222 56.1	345 20.2	·· 38.2	216 46.7	·· 35.9	41 54.5	·· 54.2	336 31.4	·· 58.7	112 38.4	50	·18 03.9	− 73
10	237 58.6	0 19.5	39.0	231 47.9	36.5	56 56.8	54.1	351 33.6	58.7	127 02.4	50	17 56.6	− 75
11	253 01.1	15 18.8	39.7	246 49.2	37.1	71 59.0	54.0	6 35.7	58.8	141 26.4	51	17 49.1	− 76
12	268 03.5	30 18.1	−18 40.5	261 50.4	+ 2 37.7	87 01.3	+ 0 53.9	21 37.9	−19 58.8	155 50.5	52	+17 41.5	− 77
13	283 06.0	45 17.3	41.2	276 51.7	38.3	102 03.6	53.9	36 40.1	58.9	170 14.7	52	17 33.8	− 79
14	298 08.5	60 16.6	41.9	291 52.9	38.9	117 05.8	53.8	51 42.2	58.9	184 38.9	53	17 25.9	− 80
15	313 10.9	75 15.9	·· 42.7	306 54.2	·· 39.5	132 08.1	·· 53.7	66 44.4	·· 58.9	199 03.2	53	·17 17.9	− 80
16	328 13.4	90 15.2	43.4	321 55.4	40.1	147 10.4	53.6	81 46.5	59.0	213 27.5	54	17 09.9	− 83
17	343 15.9	105 14.4	44.1	336 56.7	40.7	162 12.6	53.6	96 48.7	59.0	227 51.9	54	17 01.6	− 83
18	358 18.3	120 13.7	−18 44.9	351 57.9	+ 2 41.3	177 14.9	+ 0 53.5	111 50.9	−19 59.1	242 16.3	55	+16 53.3	− 84
19	13 20.8	135 13.0	45.6	6 59.2	41.9	192 17.2	53.4	126 53.0	59.1	256 40.8	56	16 44.9	− 86
20	28 23.2	150 12.3	46.3	22 00.4	42.5	207 19.4	53.4	141 55.2	59.2	271 05.4	57	16 36.3	− 86
21	43 25.7	165 11.5	·· 47.1	37 01.7	·· 43.1	222 21.7	·· 53.3	156 57.4	·· 59.2	285 30.1	57	·16 27.7	− 88
22	58 28.2	180 10.8	47.8	52 02.9	43.7	237 24.0	53.2	171 59.5	59.3	299 54.8	57	16 18.9	− 89
23	73 30.6	195 10.1	48.5	67 04.2	44.3	252 26.2	53.1	187 01.7	59.3	314 19.5	58	16 10.0	− 90
24	88 33.1	210 09.3	−18 49.2	82 05.4	+ 2 44.9	267 28.5	+ 0 53.1	202 03.9	−19 59.3	328 44.3	59	+16 01.0	− 91
code	—	− 7	− 8	+ 13	+ 6	+ 22	− 1	+ 22	− 1				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
17 00	180 59.9	−23 21.0	7	Acamar	315 50.1	−40 28.7
01	195 59.6	21.1	5	Achernar	335 58.0	−57 27.5
02	210 59.3	21.2	30	Acrux	173 56.8	−62 51.4
03	225 59.0	·· 21.3	19	Adhara	255 45.4	−28 54.8
04	240 58.7	21.4	10	Aldebaran	291 37.7	+16 25.5
05	255 58.4	21.5				
06	270 58.1	−23 21.6	32	Alioth	166 58.0	+56 11.2
07	285 57.8	21.7	34	Alkaid	153 32.5	+49 31.4
08	300 57.5	21.8	55	Al Na'ir	28 37.1	−47 10.3
09	315 57.2	·· 21.8	15	Alnilam	276 29.0	− 1 13.7
10	330 56.9	21.9	25	Alphard	218 37.5	− 8 28.4
11	345 56.6	22.0				
12	0 56.3	−23 22.1	41	Alphecca	126 47.2	+26 51.4
13	15 55.9	22.2	1	Alpheratz	358 27.3	+28 51.4
14	30 55.6	22.3	51	Altair	62 49.8	+ 8 45.4
15	45 55.3	·· 22.4	2	Ankaa	353 57.4	−42 32.5
16	60 55.0	22.4	42	Antares	113 18.6	−26 20.2
17	75 54.7	22.5				
18	90 54.4	−23 22.6	37	Arcturus	146 34.6	+19 24.2
19	105 54.1	22.7	43	Atria	108 59.0	−68 57.0
20	120 53.8	22.8	22	Avior	234 34.8	−59 22.2
21	135 53.5	·· 22.8	13	Bellatrix	279 17.1	+ 6 18.7
22	150 53.2	22.9	16	Betelg'se	271 46.8	+ 7 24.0
23	165 52.9	23.0				
			17	Canopus	264 14.4	−52 40.3
18 00	180 52.6	−23 23.1	12	Capella	281 36.6	+45 57.4
01	195 52.3	23.2	53	Deneb	50 00.7	+45 07.9
02	210 52.0	23.2	28	Denebola	183 16.8	+14 48.6
03	225 51.7	·· 23.3	4	Diphda	349 38.3	−18 13.4
04	240 51.4	23.4				
05	255 51.0	23.4	27	Dubhe	194 43.4	+61 58.6
06	270 50.7	−23 23.5	14	Elnath	279 05.8	+28 34.3
07	285 50.4	23.6	47	Eltanin	91 06.4	+51 29.7
08	300 50.1	23.7	54	Enif	34 28.9	+ 9 40.8
09	315 49.8	·· 23.7	56	Fomalhaut	16 10.7	−29 51.1
10	330 49.5	23.8				
11	345 49.2	23.9	31	Gacrux	172 48.3	−56 52.1
12	0 48.9	−23 23.9	29	Gienah	176 36.0	−17 18.2
13	15 48.6	24.0	35	Hadar	149 48.4	−60 09.8
14	30 48.3	24.1	6	Hamal	328 48.4	+23 15.7
15	45 48.0	·· 24.1	48	Kaus Aust.	84 40.4	−34 24.3
16	60 47.7	24.2				
17	75 47.4	24.3	40	Kochab	137 19.1	+74 19.7
18	90 47.1	−23 24.3	57	Markab	14 20.6	+14 58.6
19	105 46.7	24.4	8	Menkar	314 59.1	+ 3 55.4
20	120 46.4	24.4	36	Menkent	148 57.8	−36 09.4
21	135 46.1	·· 24.5	24	Miapl'dus	221 48.1	−69 32.3
22	150 45.8	24.6				
23	165 45.5	24.6	9	Mirfak	309 40.6	+49 42.7
			50	Nunki	76 51.1	−26 21.0
19 00	180 45.2	−23 24.7	52	Peacock	54 26.4	−56 52.5
01	195 44.9	24.7	21	Pollux	244 19.1	+28 07.7
02	210 44.6	24.8	20	Procyon	245 43.7	+ 5 20.1
03	225 44.3	·· 24.8				
04	240 44.0	24.9	46	R'alhague	96 46.1	+12 35.5
05	255 43.7	24.9	26	Regulus	208 28.4	+12 10.5
06	270 43.4	−23 25.0	11	Rigel	281 52.4	− 8 15.1
07	285 43.1	25.0	38	Rigil Kent.	140 50.1	−60 39.3
08	300 42.7	25.1	44	Sabik	103 01.5	−15 40.3
09	315 42.4	·· 25.1				
10	330 42.1	25.2	3	Schedar	350 28.7	+56 18.5
11	345 41.8	25.2	45	Shaula	97 19.9	−37 04.4
12	0 41.5	−23 25.3	18	Sirius	259 10.7	−16 39.4
13	15 41.2	25.3	33	Spica	159 16.1	−10 56.2
14	30 40.9	25.4	23	Suhail	223 23.3	−43 15.4
15	45 40.6	·· 25.4				
16	60 40.3	25.5	49	Vega	81 08.1	+38 44.7
17	75 40.0	25.5	39	Zub'g'bi	137 52.6	−15 51.8
18	90 39.7	−23 25.6				
19	105 39.4	25.6				
20	120 39.0	25.6				
21	135 38.7	·· 25.7				
22	150 38.4	25.7				
23	165 38.1	25.7				
24	180 37.8	−23 25.8				
code	—	➡ 1				

Lat.	Sunrise	Twlt. begins	Moonrise 17	18	19	20
N °	h m	h m	h m	h m	h m	h m
72	▬	6 52	▭	▭	14 56	17 47
70	▬	6 42	▭	13 08	15 58	18 12
68	▬	6 34	12 54	14 34	16 32	18 31
66	10 32	6 29	13 46	15 12	16 57	18 46
64	9 50	6 23	14 18	15 39	17 16	18 59
62	9 22	6 18	14 42	16 00	17 32	19 09
60	9 00	6 13	15 01	16 16	17 45	19 18
58	8 43	6 09	15 17	16 31	17 56	19 26
56	8 28	6 05	15 30	16 43	18 06	19 33
54	8 15	6 01	15 41	16 53	18 14	19 39
52	8 04	5 57	15 52	17 03	18 22	19 44
50	7 54	5 54	16 01	17 11	18 29	19 49
45	7 33	5 46	16 20	17 29	18 44	20 00
40	7 17	5 38	16 36	17 44	18 56	20 09
35	7 02	5 31	16 49	17 56	19 06	20 16
30	6 50	5 24	17 01	18 07	19 15	20 23
20	6 29	5 09	17 21	18 25	19 30	20 34
10	6 10	4 55	17 38	18 41	19 44	20 44
0	5 53	4 38	17 55	18 56	19 56	20 54
10	5 35	4 17	18 11	19 11	20 09	21 03
20	5 16	3 52	18 28	19 27	20 22	21 13
30	4 54	3 17	18 48	19 45	20 37	21 24
35	4 41	2 54	19 00	19 56	20 46	21 31
40	4 26	2 23	19 13	20 08	20 56	21 38
45	4 08	1 35	19 29	20 22	21 08	21 47
50	3 46	////	19 48	20 40	21 22	21 57
52	3 35	////	19 58	20 48	21 29	22 02
54	3 23	////	20 08	20 57	21 36	22 07
56	3 08	////	20 20	21 08	21 44	22 13
58	2 52	////	20 33	21 19	21 54	22 19
60	2 31	////	20 49	21 33	22 04	22 26
S						

Lat.	Sunset	Twlt. ends	Moonset 17	18	19	20
N °	h m	h m	h m	h m	h m	h m
72	▬	17 00	▭	▭	12 39	11 52
70	▬	17 09	▭	12 20	11 38	11 25
68	▬	17 16	10 24	10 54	11 02	11 04
66	13 21	17 23	9 32	10 15	10 37	10 48
64	14 03	17 29	9 00	9 47	10 16	10 34
62	14 32	17 35	8 36	9 26	10 00	10 23
60	14 53	17 39	8 17	9 09	9 46	10 13
58	15 11	17 44	8 01	8 54	9 35	10 04
56	15 25	17 47	7 48	8 42	9 24	9 57
54	15 38	17 51	7 36	8 31	9 15	9 50
52	15 49	17 55	7 26	8 22	9 07	9 44
50	15 59	17 59	7 16	8 13	9 00	9 38
45	16 20	18 07	6 57	7 54	8 44	9 26
40	16 37	18 15	6 41	7 40	8 31	9 16
35	16 51	18 22	6 28	7 27	8 20	9 07
30	17 03	18 29	6 16	7 16	8 10	9 00
20	17 24	18 43	5 56	6 56	7 53	8 47
10	17 43	18 58	5 39	6 40	7 39	8 35
0	18 00	19 15	5 22	6 24	7 25	8 24
10	18 18	19 36	5 06	6 08	7 11	8 13
20	18 37	20 01	4 48	5 51	6 56	8 01
30	18 59	20 36	4 28	5 32	6 39	7 47
35	19 12	20 59	4 16	5 20	6 29	7 39
40	19 27	21 30	4 03	5 07	6 17	7 30
45	19 45	22 18	3 47	4 51	6 04	7 19
50	20 08	////	3 27	4 32	5 47	7 06
52	20 18	////	3 18	4 23	5 39	7 00
54	20 31	////	3 07	4 13	5 30	6 54
56	20 45	////	2 55	4 02	5 20	6 46
58	21 02	////	2 42	3 48	5 09	6 38
60	21 22	////	2 25	3 33	4 56	6 28
S						

GMT	Equation of Time (App.—Mean) 17	18	19
h	m s	m s	m s
0	+ 4 00.3	+ 3 30.9	+ 3 01.5
6	+ 3 52.9	+ 3 23.6	+ 2 54.1
12	+ 3 45.6	+ 3 16.2	+ 2 46.7
18	+ 3 38.3	+ 3 08.8	+ 2 39.2
24	+ 3 30.9	+ 3 01.5	+ 2 31.8

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
17	24 09	9 56	18 36	6 20	10 41
18	0 09	9 58	18 34	6 16	10 37
19	1 11	9 59	18 32	6 13	10 34
20	2 10	10 00	18 30	6 09	10 30

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.6	0.1	0.2
30	0.6	0.1	0.1
45	0.6	0.1	0.1
60	0.6	0.0	0.1
75	0.6	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	17	18	19
°	′	′	′
0	19.5	20.1	20.3
4	19.5	20.1	20.2
8	19.5	20.1	20.2
12	19.4	20.0	20.1
16	19.3	20.0	20.1
20	19.3	19.9	20.0
24	19.2	19.8	19.9
28	19.1	19.7	19.8
32	19.0	19.5	19.6
36	18.8	19.4	19.5
40	18.7	19.2	19.3
44	18.5	19.0	19.1
48	18.4	18.8	18.9
52	18.2	18.6	18.7
56	18.0	18.4	18.5
60	17.9	18.2	18.3
64	17.7	18.0	18.1
68	17.5	17.8	17.8
72	17.2	17.5	17.6
76	17.0	17.3	17.3
80	16.8	17.0	17.1
84	16.6	16.8	16.8
88	16.4	16.6	16.6
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	17	18	19
°	′	′	′
0	13.3	12.9	12.9
4	13.3	13.0	12.9
8	13.3	13.0	12.9
12	13.4	13.0	13.0
16	13.4	13.1	13.0
20	13.5	13.2	13.1
24	13.6	13.3	13.2
28	13.7	13.4	13.4
32	13.8	13.5	13.5
36	14.0	13.7	13.6
40	14.1	13.9	13.8
44	14.2	14.0	14.0
48	14.4	14.2	14.2
52	14.6	14.4	14.4
56	14.8	14.6	14.6
60	14.9	14.8	14.8
64	15.1	15.1	15.1
68	15.3	15.3	15.3
72	15.5	15.5	15.5
76	15.7	15.8	15.8
80	16.0	16.0	16.0
84	16.2	16.3	16.3
88	16.3	16.5	16.5
90			

Subtract from table, back cover

Full Moon 17

GMT	♈ GHA	VENUS −3.4 GHA	VENUS −3.4 Dec.	MARS 0.1 GHA	MARS 0.1 Dec.	JUPITER −1.6 GHA	JUPITER −1.6 Dec.	SATURN 0.7 GHA	SATURN 0.7 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
20 0	88 33.1	210 09.3	−18 49.2	82 05.4	+ 2 44.9	267 28.5	+ 0 53.1	202 03.9	−19 59.3	328 44.3	59	+16 01.0	− 91
1	103 35.6	225 08.6	50.0	97 06.7	45.5	282 30.8	53.0	217 06.0	59.4	343 09.2	60	15 51.9	− 92
2	118 38.0	240 07.9	50.7	112 07.9	46.1	297 33.1	52.9	232 08.2	59.4	357 34.2	60	15 42.7	− 93
3	133 40.5	255 07.1	·· 51.4	127 09.2	·· 46.7	312 35.3	·· 52.8	247 10.4	·· 59.5	11 59.2	61	·15 33.4	− 94
4	148 43.0	270 06.4	52.1	142 10.4	47.3	327 37.6	52.8	262 12.5	59.5	26 24.3	62	15 24.0	− 95
5	163 45.4	285 05.7	52.9	157 11.7	47.9	342 39.9	52.7	277 14.7	59.6	40 49.5	62	15 14.5	− 97
6	178 47.9	300 04.9	−18 53.6	172 12.9	+ 2 48.5	357 42.1	+ 0 52.6	292 16.9	−19 59.6	55 14.7	63	+15 04.8	− 97
7	193 50.4	315 04.2	54.3	187 14.2	49.1	12 44.4	52.6	307 19.0	59.7	69 40.0	64	14 55.1	− 98
8	208 52.8	330 03.5	55.0	202 15.4	49.7	27 46.7	52.5	322 21.2	59.7	84 05.4	64	14 45.3	− 99
9	223 55.3	345 02.7	·· 55.7	217 16.7	·· 50.3	42 49.0	·· 52.4	337 23.3	·· 59.8	98 30.8	65	·14 35.4	−100
10	238 57.7	0 02.0	56.4	232 17.9	50.9	57 51.2	52.3	352 25.5	59.8	112 56.3	66	14 25.4	−101
11	254 00.2	15 01.3	57.2	247 19.2	51.5	72 53.5	52.3	7 27.7	59.8	127 21.9	66	14 15.3	−101
12	269 02.7	30 00.5	−18 57.9	262 20.4	+ 2 52.1	87 55.8	+ 0 52.2	22 29.8	−19 59.9	141 47.5	67	+14 05.2	−103
13	284 05.1	44 59.8	58.6	277 21.7	52.7	102 58.0	52.1	37 32.0	19 59.9	156 13.2	68	13 54.9	−104
14	299 07.6	59 59.1	18 59.3	292 22.9	53.3	118 00.3	52.1	52 34.2	20 00.0	170 39.0	69	13 44.5	−104
15	314 10.1	74 58.3	·19 00.0	307 24.2	·· 53.9	133 02.6	·· 52.0	67 36.3	·· 00.0	185 04.9	69	·13 34.1	−105
16	329 12.5	89 57.6	00.7	322 25.4	54.5	148 04.9	51.9	82 38.5	00.1	199 30.8	70	13 23.6	−106
17	344 15.0	104 56.9	01.4	337 26.6	55.1	163 07.1	51.8	97 40.7	00.1	213 56.8	71	13 13.0	−107
18	359 17.5	119 56.1	−19 02.2	352 27.9	+ 2 55.7	178 09.4	+ 0 51.8	112 42.8	−20 00.2	228 22.9	71	+13 02.3	−108
19	14 19.9	134 55.4	02.9	7 29.1	56.3	193 11.7	51.7	127 45.0	00.2	242 49.0	72	12 51.5	−108
20	29 22.4	149 54.6	03.6	22 30.4	56.9	208 14.0	51.6	142 47.2	00.2	257 15.2	73	12 40.7	−109
21	44 24.9	164 53.9	·· 04.3	37 31.6	·· 57.5	223 16.2	·· 51.6	157 49.3	·· 00.3	271 41.5	73	·12 29.8	−110
22	59 27.3	179 53.2	05.0	52 32.9	58.1	238 18.5	51.5	172 51.5	00.3	286 07.8	75	12 18.8	−111
23	74 29.8	194 52.4	05.7	67 34.1	58.7	253 20.8	51.4	187 53.7	00.4	300 34.3	74	12 07.7	−111
21 0	89 32.2	209 51.7	−19 06.4	82 35.4	+ 2 59.3	268 23.1	+ 0 51.4	202 55.8	−20 00.4	315 00.7	76	+11 56.6	−112
1	104 34.7	224 50.9	07.1	97 36.6	2 59.9	283 25.3	51.3	217 58.0	00.5	329 27.3	76	11 45.4	−113
2	119 37.2	239 50.2	07.8	112 37.8	3 00.5	298 27.6	51.2	233 00.2	00.5	343 53.9	77	11 34.1	−113
3	134 39.6	254 49.4	·· 08.5	127 39.1	·· 01.1	313 29.9	·· 51.1	248 02.3	·· 00.6	358 20.6	78	·11 22.8	−114
4	149 42.1	269 48.7	09.2	142 40.3	01.7	328 32.2	51.1	263 04.5	00.6	12 47.4	78	11 11.4	−115
5	164 44.6	284 48.0	09.9	157 41.6	02.3	343 34.4	51.0	278 06.7	00.6	27 14.2	79	10 59.9	−115
6	179 47.0	299 47.2	−19 10.6	172 42.8	+ 3 02.9	358 36.7	+ 0 50.9	293 08.8	−20 00.7	41 41.1	80	+10 48.4	−116
7	194 49.5	314 46.5	11.3	187 44.0	03.5	13 39.0	50.9	308 11.0	00.7	56 08.1	80	10 36.8	−117
8	209 52.0	329 45.7	12.0	202 45.3	04.1	28 41.3	50.8	323 13.2	00.8	70 35.1	81	10 25.1	−117
9	224 54.4	344 45.0	·· 12.7	217 46.5	·· 04.7	43 43.6	·· 50.7	338 15.3	·· 00.8	85 02.2	82	·10 13.4	−117
10	239 56.9	359 44.2	13.4	232 47.8	05.3	58 45.8	50.7	353 17.5	00.9	99 29.4	83	10 01.7	−119
11	254 59.4	14 43.5	14.1	247 49.0	05.9	73 48.1	50.6	8 19.7	00.9	113 56.7	83	9 49.8	−118
12	270 01.8	29 42.7	−19 14.8	262 50.3	+ 3 06.5	88 50.4	+ 0 50.5	23 21.8	−20 01.0	128 24.0	83	+ 9 38.0	−119
13	285 04.3	44 42.0	15.5	277 51.5	07.1	103 52.7	50.5	38 24.0	01.0	142 51.3	85	9 26.1	−120
14	300 06.7	59 41.2	16.2	292 52.7	07.7	118 55.0	50.4	53 26.2	01.0	157 18.8	85	9 14.1	−120
15	315 09.2	74 40.5	·· 16.9	307 54.0	·· 08.3	133 57.2	·· 50.3	68 28.3	·· 01.1	171 46.3	85	· 9 02.1	−121
16	330 11.7	89 39.7	17.6	322 55.2	08.9	148 59.5	50.3	83 30.5	01.1	186 13.8	87	8 50.0	−121
17	345 14.1	104 39.0	18.2	337 56.4	09.5	164 01.8	50.2	98 32.7	01.2	200 41.5	87	8 37.9	−121
18	0 16.6	119 38.2	−19 18.9	352 57.7	+ 3 10.1	179 04.1	+ 0 50.1	113 34.8	−20 01.2	215 09.2	87	+ 8 25.8	−122
19	15 19.1	134 37.5	19.6	7 58.9	10.7	194 06.4	50.1	128 37.0	01.3	229 36.9	88	8 13.6	−122
20	30 21.5	149 36.7	20.3	23 00.2	11.3	209 08.6	50.0	143 39.2	01.3	244 04.7	89	8 01.4	−123
21	45 24.0	164 36.0	·· 21.0	38 01.4	·· 11.9	224 10.9	·· 49.9	158 41.3	·· 01.4	258 32.6	90	· 7 49.1	−123
22	60 26.5	179 35.2	21.7	53 02.6	12.5	239 13.2	49.8	173 43.5	01.4	273 00.6	90	7 36.8	−124
23	75 28.9	194 34.5	22.4	68 03.9	13.1	254 15.5	49.8	188 45.7	01.4	287 28.6	90	7 24.4	−123
22 0	90 31.4	209 33.7	−19 23.0	83 05.1	+ 3 13.7	269 17.8	+ 0 49.7	203 47.8	−20 01.5	301 56.6	91	+ 7 12.1	−124
1	105 33.8	224 33.0	23.7	98 06.3	14.3	284 20.0	49.6	218 50.0	01.5	316 24.7	92	6 59.7	−125
2	120 36.3	239 32.2	24.4	113 07.6	14.9	299 22.3	49.6	233 52.2	01.6	330 52.9	93	6 47.2	−124
3	135 38.8	254 31.5	·· 25.1	128 08.8	·· 15.5	314 24.6	·· 49.5	248 54.3	·· 01.6	345 21.2	93	· 6 34.8	−125
4	150 41.2	269 30.7	25.8	143 10.0	16.1	329 26.9	49.4	263 56.5	01.7	359 49.5	93	6 22.3	−126
5	165 43.7	284 30.0	26.4	158 11.3	16.7	344 29.2	49.4	278 58.7	01.7	14 17.8	94	6 09.7	−125
6	180 46.2	299 29.2	−19 27.1	173 12.5	+ 3 17.3	359 31.5	+ 0 49.3	294 00.8	−20 01.8	28 46.2	95	+ 5 57.2	−126
7	195 48.6	314 28.4	27.8	188 13.7	17.9	14 33.7	49.2	309 03.0	01.8	43 14.7	95	5 44.6	−126
8	210 51.1	329 27.7	28.5	203 15.0	18.5	29 36.0	49.2	324 05.2	01.8	57 43.2	95	5 32.0	−126
9	225 53.6	344 26.9	·· 29.2	218 16.2	·· 19.1	44 38.3	·· 49.1	339 07.3	·· 01.9	72 11.7	97	· 5 19.4	−126
10	240 56.0	359 26.2	29.8	233 17.4	19.7	59 40.6	49.1	354 09.5	01.9	86 40.4	96	5 06.8	−127
11	255 58.5	14 25.4	30.5	248 18.7	20.3	74 42.9	49.0	9 11.7	02.0	101 09.0	98	4 54.1	−127
12	271 01.0	29 24.6	−19 31.2	263 19.9	+ 3 20.9	89 45.2	+ 0 48.9	24 13.8	−20 02.0	115 37.8	97	+ 4 41.4	−126
13	286 03.4	44 23.9	31.8	278 21.1	21.5	104 47.5	48.9	39 16.0	02.1	130 06.5	99	4 28.8	−127
14	301 05.9	59 23.1	32.5	293 22.4	22.1	119 49.7	48.8	54 18.2	02.1	144 35.4	98	4 16.1	−128
15	316 08.3	74 22.4	·· 33.2	308 23.6	·· 22.7	134 52.0	·· 48.7	69 20.3	·· 02.1	159 04.2	100	· 4 03.3	−127
16	331 10.8	89 21.6	33.9	323 24.8	23.3	149 54.3	48.7	84 22.5	02.2	173 33.2	99	3 50.6	−127
17	346 13.3	104 20.8	34.5	338 26.1	23.9	164 56.6	48.6	99 24.7	02.2	188 02.1	100	3 37.9	−128
18	1 15.7	119 20.1	−19 35.2	353 27.3	+ 3 24.5	179 58.9	+ 0 48.5	114 26.9	−20 02.3	202 31.1	101	+ 3 25.1	−127
19	16 18.2	134 19.3	35.9	8 28.5	25.1	195 01.2	48.5	129 29.0	02.3	217 00.2	101	3 12.4	−128
20	31 20.7	149 18.6	36.5	23 29.8	25.7	210 03.5	48.4	144 31.2	02.4	231 29.3	101	2 59.6	−127
21	46 23.1	164 17.8	·· 37.2	38 31.0	·· 26.3	225 05.8	·· 48.3	159 33.4	·· 02.4	245 58.4	102	· 2 46.9	−128
22	61 25.6	179 17.0	37.8	53 32.2	26.9	240 08.0	48.3	174 35.5	02.5	260 27.6	103	2 34.1	−128
23	76 28.1	194 16.3	38.5	68 33.4	27.5	255 10.3	48.2	189 37.7	02.5	274 56.9	102	2 21.3	−127
24	91 30.5	209 15.5	−19 39.2	83 34.7	+ 3 28.1	270 12.6	+ 0 48.1	204 39.9	−20 02.5	289 26.1	103	+ 2 08.6	−128
code	−	− 7	− 7	+ 12	+ 6	+ 23	0	+ 22	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
20 0	180 37.8	−23 25.8	7	Acamar	315 50.1	−40 28.7
1	195 37.5	25.8	5	Achernar	335 58.0	−57 27.5
2	210 37.2	25.9	30	Acrux	173 56.8	−62 51.4
3	225 36.9	25.9	19	Adhara	255 45.4	−28 54.8
4	240 36.6	25.9	10	Aldebaran	291 37.7	+16 25.5
5	255 36.3	26.0				
6	270 35.9	−23 26.0	32	Alioth	166 58.0	+56 11.2
7	285 35.6	26.0	34	Alkaid	153 32.5	+49 31.4
8	300 35.3	26.1	55	Al Na'ir	28 37.1	−47 10.3
9	315 35.0	26.1	15	Alnilam	276 29.0	− 1 13.7
10	330 34.7	26.1	25	Alphard	218 37.5	− 8 28.4
11	345 34.4	26.1				
12	0 34.1	−23 26.2	41	Alphecca	126 47.2	+26 51.4
13	15 33.8	26.2	1	Alpheratz	358 27.3	+28 51.4
14	30 33.5	26.2	51	Altair	62 49.8	+ 8 45.4
15	45 33.2	26.2	2	Ankaa	353 57.4	−42 32.5
16	60 32.9	26.3	42	Antares	113 18.6	−26 20.2
17	75 32.5	26.3				
18	90 32.2	−23 26.3	37	Arcturus	146 34.6	+19 24.2
19	105 31.9	26.3	43	Atria	108 59.0	−68 56.9
20	120 31.6	26.4	22	Avior	234 34.8	−59 22.2
21	135 31.3	26.4	13	Bellatrix	279 17.1	+ 6 18.7
22	150 31.0	26.4	16	Betelg'se	271 46.8	+ 7 24.0
23	165 30.7	26.4				
			17	Canopus	264 14.4	−52 40.3
21 0	180 30.4	−23 26.4	12	Capella	281 36.6	+45 57.4
1	195 30.1	26.4	53	Deneb	50 00.7	+45 07.8
2	210 29.8	26.5	28	Denebola	183 16.8	+14 48.6
3	225 29.4	26.5	4	Diphda	349 38.3	−18 13.4
4	240 29.1	26.5				
5	255 28.8	26.5	27	Dubhe	194 43.4	+61 58.6
6	270 28.5	−23 26.5	14	Elnath	279 05.8	+28 34.3
7	285 28.2	26.5	47	Eltanin	91 06.4	+51 29.7
8	300 27.9	26.5	54	Enif	34 28.9	+ 9 40.8
9	315 27.6	26.6	56	Fomalhaut	16 10.8	−29 51.1
10	330 27.3	26.6				
11	345 27.0	26.6	31	Gacrux	172 48.2	−56 52.1
12	0 26.6	−23 26.6	29	Gienah	176 35.9	−17 18.2
13	15 26.3	26.6	35	Hadar	149 48.4	−60 09.8
14	30 26.0	26.6	6	Hamal	328 48.4	+23 15.7
15	45 25.7	26.6	48	Kaus Aust.	84 40.4	−34 24.3
16	60 25.4	26.6				
17	75 25.1	26.6	40	Kochab	137 19.0	+74 19.6
18	90 24.8	−23 26.6	57	Markab	14 20.6	+14 58.6
19	105 24.5	26.6	8	Menkar	314 59.1	+ 3 55.3
20	120 24.2	26.6	36	Menkent	148 57.8	−36 09.4
21	135 23.9	26.6	24	Miapl'dus	221 48.1	−69 32.3
22	150 23.5	26.6				
23	165 23.2	26.6	9	Mirfak	309 40.6	+49 42.7
			50	Nunki	76 51.1	−26 21.0
22 0	180 22.9	−23 26.6	52	Peacock	54 26.4	−56 52.5
1	195 22.6	26.6	21	Pollux	244 19.1	+28 07.7
2	210 22.3	26.6	20	Procyon	245 43.7	+ 5 20.1
3	225 22.0	26.6				
4	240 21.7	26.6	46	R'alhague	96 46.1	+12 35.5
5	255 21.4	26.6	26	Regulus	208 28.4	+12 10.5
6	270 21.1	−23 26.6	11	Rigel	281 52.4	− 8 15.1
7	285 20.7	26.6	38	Rigil Kent.	140 50.1	−60 39.3
8	300 20.4	26.6	44	Sabik	103 01.5	−15 40.3
9	315 20.1	26.6				
10	330 19.8	26.5	3	Schedar	350 28.7	+56 18.5
11	345 19.5	26.5	45	Shaula	97 19.9	−37 04.4
12	0 19.2	−23 26.5	18	Sirius	259 10.7	−16 39.4
13	15 18.9	26.5	33	Spica	159 16.0	−10 56.2
14	30 18.6	26.5	23	Suhail	223 23.3	−43 15.4
15	45 18.3	26.5				
16	60 17.9	26.5	49	Vega	81 08.1	+38 44.7
17	75 17.6	26.4	39	Zub'g'bi	137 52.6	−15 51.8
18	90 17.3	−23 26.4				
19	105 17.0	26.4				
20	120 16.7	26.4				
21	135 16.4	26.4				
22	150 16.1	26.4				
23	165 15.8	26.3				
24	180 15.5	−23 26.3				
code	—	0				

GMT	Equation of Time (App.—Mean) 20	21	22
h	m s	m s	m s
0	+ 2 31.8	+ 2 02.1	+ 1 32.3
6	+ 2 24.4	+ 1 54.7	+ 1 24.8
12	+ 2 17.0	+ 1 47.2	+ 1 17.4
18	+ 2 09.5	+ 1 39.8	+ 1 09.9
24	+ 2 02.1	+ 1 32.3	+ 1 02.4

Lat. N °	Sunrise h m	Twlt. begins h m	Moonrise 20 h m	21 h m	22 h m	23 h m
72	▬	6 54	17 47	20 04	22 09	24 10
70	▬	6 45	18 12	20 16	22 13	24 05
68	▬	6 37	18 31	20 26	22 15	24 02
66	10 35	6 31	18 46	20 34	22 18	23 58
64	9 52	6 25	18 59	20 41	22 20	23 56
62	9 24	6 20	19 09	20 47	22 21	23 54
60	9 02	6 15	19 18	20 52	22 23	23 52
58	8 44	6 11	19 26	20 56	22 24	23 50
56	8 30	6 07	19 33	21 00	22 26	23 49
54	8 17	6 02	19 39	21 04	22 27	23 47
52	8 06	5 59	19 44	21 07	22 28	23 46
50	7 56	5 55	19 49	21 10	22 28	23 45
45	7 35	5 48	20 00	21 16	22 30	23 42
40	7 18	5 40	20 09	21 21	22 32	23 40
35	7 04	5 33	20 16	21 26	22 33	23 39
30	6 52	5 25	20 23	21 30	22 34	23 37
20	6 30	5 11	20 34	21 37	22 37	23 35
10	6 12	4 56	20 44	21 43	22 38	23 32
0	5 54	4 39	20 54	21 48	22 40	23 30
10	5 37	4 18	21 03	21 54	22 42	23 28
20	5 18	3 53	21 13	22 00	22 44	23 26
30	4 56	3 18	21 24	22 07	22 46	23 24
35	4 43	2 55	21 31	22 11	22 47	23 22
40	4 27	2 24	21 38	22 15	22 49	23 21
45	4 10	1 36	21 47	22 20	22 50	23 19
50	3 47	////	21 57	22 26	22 52	23 17
52	3 36	////	22 02	22 29	22 53	23 16
54	3 24	////	22 07	22 32	22 54	23 15
56	3 09	////	22 13	22 35	22 55	23 14
58	2 53	////	22 19	22 39	22 57	23 13
60	2 32	////	22 26	22 43	22 58	23 11
S						

Lat. N °	Sunset h m	Twlt. ends h m	Moonset 20 h m	21 h m	22 h m	23 h m
72	▬	17 01	11 52	11 30	11 15	11 00
70	▬	17 10	11 25	11 16	11 08	11 01
68	▬	17 18	11 04	11 04	11 03	11 01
66	13 21	17 24	10 48	10 54	10 58	11 01
64	14 04	17 30	10 34	10 46	10 55	11 02
62	14 33	17 36	10 23	10 39	10 51	11 02
60	14 54	17 40	10 13	10 32	10 48	11 02
58	15 12	17 45	10 04	10 27	10 46	11 02
56	15 27	17 49	9 57	10 22	10 43	11 02
54	15 39	17 53	9 50	10 17	10 41	11 03
52	15 50	17 56	9 44	10 13	10 39	11 03
50	16 00	18 00	9 38	10 10	10 37	11 03
45	16 21	18 08	9 26	10 02	10 34	11 03
40	16 38	18 16	9 16	9 55	10 30	11 03
35	16 52	18 23	9 07	9 49	10 28	11 03
30	17 05	18 31	9 00	9 44	10 25	11 04
20	17 26	18 45	8 47	9 35	10 21	11 04
10	17 44	18 59	8 35	9 27	10 17	11 04
0	18 02	19 17	8 24	9 20	10 13	11 04
10	18 19	19 37	8 13	9 12	10 09	11 04
20	18 38	20 02	8 01	9 04	10 05	11 04
30	19 01	20 38	7 47	8 55	10 01	11 05
35	19 14	21 01	7 39	8 50	9 58	11 05
40	19 29	21 32	7 30	8 43	9 55	11 05
45	19 47	22 20	7 19	8 36	9 51	11 05
50	20 09	////	7 06	8 27	9 47	11 05
52	20 20	////	7 00	8 23	9 45	11 05
54	20 33	////	6 54	8 19	9 43	11 05
56	20 47	////	6 46	8 14	9 41	11 05
58	21 04	////	6 38	8 08	9 38	11 05
60	21 24	////	6 28	8 02	9 35	11 05
S						

GMT of Transit Meridian of Greenwich

DAY	Moon h m	Venus h m	Mars h m	Jupiter h m	Saturn h m
20	2 10	10 00	18 30	6 09	10 30
21	3 07	10 01	18 28	6 06	10 27
22	4 01	10 02	18 26	6 02	10 23
23	4 52	10 04	18 24	5 58	10 20

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb **Add**	Venus **Add**	Mars **Add**
°	′	′	′
0	0.6	0.1	0.1
30	0.6	0.1	0.1
45	0.6	0.1	0.1
60	0.6	0.0	0.1
75	0.6	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	20	21	22
°	′	′	′
0	20.1	19.6	19.0
4	20.1	19.6	19.0
8	20.1	19.6	18.9
12	20.0	19.5	18.9
16	20.0	19.5	18.9
20	19.9	19.4	18.8
24	19.8	19.3	18.7
28	19.7	19.2	18.6
32	19.5	19.1	18.5
36	19.4	18.9	18.4
40	19.2	18.8	18.3
44	19.0	18.6	18.2
48	18.8	18.5	18.0
52	18.6	18.3	17.9
56	18.4	18.1	17.7
60	18.2	17.9	17.6
64	18.0	17.7	17.4
68	17.8	17.5	17.2
72	17.5	17.3	17.0
76	17.3	17.1	16.8
80	17.0	16.9	16.7
84	16.8	16.6	16.5
88	16.6	16.5	16.3
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	20	21	22
°	′	′	′
0	12.9	13.2	13.6
4	13.0	13.2	13.6
8	13.0	13.3	13.6
12	13.0	13.3	13.7
16	13.1	13.4	13.7
20	13.2	13.5	13.8
24	13.3	13.5	13.9
28	13.4	13.6	13.9
32	13.5	13.8	14.0
36	13.7	13.9	14.2
40	13.9	14.0	14.3
44	14.0	14.2	14.4
48	14.2	14.4	14.5
52	14.4	14.5	14.7
56	14.6	14.7	14.9
60	14.8	14.9	15.0
64	15.1	15.1	15.2
68	15.3	15.3	15.4
72	15.5	15.5	15.5
76	15.8	15.8	15.7
80	16.0	16.0	15.9
84	16.3	16.2	16.1
88	16.5	16.4	16.2
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.4 GHA	VENUS −3.4 Dec.	MARS 0.1 GHA	MARS 0.1 Dec.	JUPITER −1.6 GHA	JUPITER −1.6 Dec.	SATURN 0.7 GHA	SATURN 0.7 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
23 0	91 30.5	209 15.5	−19 39.2	83 34.7	+ 3 28.1	270 12.6	+ 0 48.1	204 39.9	−20 02.5	289 26.1	103	+ 2 08.6	−128
1	106 33.0	224 14.7	39.8	98 35.9	28.7	285 14.9	48.1	219 42.0	02.6	303 55.4	104	1 55.8	−128
2	121 35.5	239 14.0	40.5	113 37.1	29.3	300 17.2	48.0	234 44.2	02.6	318 24.8	104	1 43.0	−127
3	136 37.9	254 13.2	·· 41.1	128 38.4	·· 29.9	315 19.5	·· 48.0	249 46.4	·· 02.7	332 54.2	104	· 1 30.3	−128
4	151 40.4	269 12.4	41.8	143 39.6	30.5	330 21.8	47.9	264 48.5	02.7	347 23.6	105	1 17.5	−128
5	166 42.8	284 11.7	42.5	158 40.8	31.1	345 24.1	47.8	279 50.7	02.8	1 53.1	105	1 04.7	−127
6	181 45.3	299 10.9	−19 43.1	173 42.0	+ 3 31.7	0 26.4	+ 0 47.8	294 52.9	−20 02.8	16 22.6	105	+ 0 52.0	−127
7	196 47.8	314 10.1	43.8	188 43.3	32.3	15 28.6	47.7	309 55.0	02.8	30 52.1	106	0 39.3	−128
8	211 50.2	329 09.3	44.4	203 44.5	32.9	30 30.9	47.6	324 57.2	02.9	45 21.7	106	0 26.5	−127
9	226 52.7	344 08.6	·· 45.1	218 45.7	·· 33.5	45 33.2	·· 47.6	339 59.4	·· 02.9	59 51.3	106	· 0 13.8	−127
10	241 55.2	359 07.8	45.7	233 46.9	34.1	60 35.5	47.5	355 01.5	03.0	74 20.9	107	+ 0 01.1	−127
11	256 57.6	14 07.0	46.4	248 48.2	34.7	75 37.8	47.4	10 03.7	03.0	88 50.6	107	− 0 11.6	−127
12	272 00.1	29 06.3	−19 47.0	263 49.4	+ 3 35.3	90 40.1	+ 0 47.4	25 05.9	−20 03.1	103 20.3	107	− 0 24.3	−127
13	287 02.6	44 05.5	47.7	278 50.6	35.9	105 42.4	47.3	40 08.1	03.1	117 50.0	108	0 37.0	−126
14	302 05.0	59 04.7	48.3	293 51.8	36.5	120 44.7	47.3	55 10.2	03.1	132 19.8	108	0 49.6	−127
15	317 07.5	74 03.9	·· 49.0	308 53.1	·· 37.1	135 47.0	·· 47.2	70 12.4	·· 03.2	146 49.6	108	· 1 02.3	−126
16	332 09.9	89 03.2	49.6	323 54.3	37.7	150 49.3	47.1	85 14.6	03.2	161 19.4	108	1 14.9	−126
17	347 12.4	104 02.4	50.3	338 55.5	38.3	165 51.6	47.1	100 16.7	03.3	175 49.2	109	1 27.5	−126
18	2 14.9	119 01.6	−19 50.9	353 56.7	+ 3 38.9	180 53.9	+ 0 47.0	115 18.9	−20 03.3	190 19.1	109	− 1 40.1	−125
19	17 17.3	134 00.9	51.5	8 58.0	39.5	195 56.2	46.9	130 21.1	03.4	204 49.0	109	1 52.6	−126
20	32 19.8	149 00.1	52.2	23 59.2	40.1	210 58.4	46.9	145 23.2	03.4	219 18.9	110	2 05.2	−125
21	47 22.3	163 59.3	·· 52.8	39 00.4	·· 40.7	226 00.7	·· 46.8	160 25.4	·· 03.4	233 48.9	109	· 2 17.7	−125
22	62 24.7	178 58.5	53.5	54 01.6	41.3	241 03.0	46.8	175 27.6	03.5	248 18.8	110	2 30.2	−125
23	77 27.2	193 57.7	54.1	69 02.9	41.9	256 05.3	46.7	190 29.7	03.5	262 48.8	110	2 42.7	−124
24 0	92 29.7	208 57.0	−19 54.7	84 04.1	+ 3 42.6	271 07.6	+ 0 46.6	205 31.9	−20 03.6	277 18.8	111	− 2 55.1	−124
1	107 32.1	223 56.2	55.4	99 05.3	43.2	286 09.9	46.6	220 34.1	03.6	291 48.9	110	3 07.5	−124
2	122 34.6	238 55.4	56.0	114 06.5	43.8	301 12.2	46.5	235 36.3	03.7	306 18.9	111	3 19.9	−123
3	137 37.1	253 54.6	·· 56.7	129 07.7	·· 44.4	316 14.5	·· 46.5	250 38.4	·· 03.7	320 49.0	110	· 3 32.2	−124
4	152 39.5	268 53.9	57.3	144 09.0	45.0	331 16.8	46.4	265 40.6	03.7	335 19.0	111	3 44.6	−122
5	167 42.0	283 53.1	57.9	159 10.2	45.6	346 19.1	46.3	280 42.8	03.8	349 49.1	112	3 56.8	−123
6	182 44.4	298 52.3	−19 58.6	174 11.4	+ 3 46.2	1 21.4	+ 0 46.3	295 44.9	−20 03.8	4 19.3	111	− 4 09.1	−122
7	197 46.9	313 51.5	59.2	189 12.6	46.8	16 23.7	46.2	310 47.1	03.9	18 49.4	111	4 21.3	−122
8	212 49.4	328 50.7	19 59.8	204 13.8	47.4	31 26.0	46.2	325 49.3	03.9	33 19.5	112	4 33.5	−122
9	227 51.8	343 50.0	·20 00.4	219 15.1	·· 48.0	46 28.3	·· 46.1	340 51.4	·· 04.0	47 49.7	112	· 4 45.7	−121
10	242 54.3	358 49.2	01.1	234 16.3	48.6	61 30.6	46.0	355 53.6	04.0	62 19.9	111	4 57.8	−121
11	257 56.8	13 48.4	01.7	249 17.5	49.2	76 32.9	46.0	10 55.8	04.0	76 50.0	112	5 09.9	−120
12	272 59.2	28 47.6	−20 02.3	264 18.7	+ 3 49.8	91 35.2	+ 0 45.9	25 58.0	−20 04.1	91 20.2	112	− 5 21.9	−120
13	288 01.7	43 46.8	03.0	279 19.9	50.4	106 37.5	45.9	41 00.1	04.1	105 50.4	112	5 33.9	−119
14	303 04.2	58 46.0	03.6	294 21.1	51.0	121 39.8	45.8	56 02.3	04.2	120 20.6	113	5 45.8	−120
15	318 06.6	73 45.3	·· 04.2	309 22.4	·· 51.6	136 42.1	·· 45.7	71 04.5	·· 04.2	134 50.9	112	· 5 57.8	−118
16	333 09.1	88 44.5	04.8	324 23.6	52.2	151 44.4	45.7	86 06.6	04.3	149 21.1	112	6 09.6	−119
17	348 11.6	103 43.7	05.4	339 24.8	52.8	166 46.7	45.6	101 08.8	04.3	163 51.3	113	6 21.5	−117
18	3 14.0	118 42.9	−20 06.1	354 26.0	+ 3 53.4	181 49.0	+ 0 45.6	116 11.0	−20 04.3	178 21.6	112	− 6 33.2	−118
19	18 16.5	133 42.1	06.7	9 27.2	54.0	196 51.3	45.5	131 13.1	04.4	192 51.8	113	6 45.0	−117
20	33 18.9	148 41.3	07.3	24 28.4	54.6	211 53.6	45.4	146 15.3	04.4	207 22.1	112	6 56.7	−116
21	48 21.4	163 40.5	·· 07.9	39 29.7	·· 55.2	226 55.9	·· 45.4	161 17.5	·· 04.5	221 52.3	113	· 7 08.3	−116
22	63 23.9	178 39.8	08.5	54 30.9	55.8	241 58.2	45.3	176 19.7	04.5	236 22.6	112	7 19.9	−116
23	78 26.3	193 39.0	09.2	69 32.1	56.4	257 00.5	45.3	191 21.8	04.6	250 52.8	113	7 31.5	−115
25 0	93 28.8	208 38.2	−20 09.8	84 33.3	+ 3 57.0	272 02.8	+ 0 45.2	206 24.0	−20 04.6	265 23.1	113	− 7 43.0	−114
1	108 31.3	223 37.4	10.4	99 34.5	57.6	287 05.1	45.1	221 26.2	04.6	279 53.4	113	7 54.4	−114
2	123 33.7	238 36.6	11.0	114 35.7	58.2	302 07.4	45.1	236 28.3	04.7	294 23.7	112	8 05.8	−113
3	138 36.2	253 35.8	·· 11.6	129 37.0	·· 58.8	317 09.7	·· 45.0	251 30.5	·· 04.7	308 53.9	113	· 8 17.1	−113
4	153 38.7	268 35.0	12.2	144 38.2	3 59.4	332 12.0	45.0	266 32.7	04.8	323 24.2	113	8 28.4	−112
5	168 41.1	283 34.2	12.8	159 39.4	4 00.0	347 14.3	44.9	281 34.9	04.8	337 54.5	112	8 39.6	−112
6	183 43.6	298 33.4	−20 13.4	174 40.6	+ 4 00.6	2 16.6	+ 0 44.9	296 37.0	−20 04.9	352 24.7	113	− 8 50.8	−111
7	198 46.1	313 32.6	14.1	189 41.8	01.2	17 18.9	44.8	311 39.2	04.9	6 55.0	112	9 01.9	−111
8	213 48.5	328 31.8	14.7	204 43.0	01.8	32 21.2	44.7	326 41.4	04.9	21 25.2	113	9 13.0	−110
9	228 51.0	343 31.1	·· 15.3	219 44.2	·· 02.4	47 23.5	·· 44.7	341 43.5	·· 05.0	35 55.5	113	· 9 24.0	−110
10	243 53.4	358 30.3	15.9	234 45.4	03.1	62 25.8	44.6	356 45.7	05.0	50 25.8	112	9 35.0	−109
11	258 55.9	13 29.5	16.5	249 46.7	03.7	77 28.1	44.6	11 47.9	05.1	64 56.0	113	9 45.9	−108
12	273 58.4	28 28.7	−20 17.1	264 47.9	+ 4 04.3	92 30.4	+ 0 44.5	26 50.1	−20 05.1	79 26.3	112	− 9 56.7	−107
13	289 00.8	43 27.9	17.7	279 49.1	04.9	107 32.7	44.5	41 52.2	05.2	93 56.5	112	10 07.4	−107
14	304 03.3	58 27.1	18.3	294 50.3	05.5	122 35.0	44.4	56 54.4	05.2	108 26.7	112	10 18.1	−107
15	319 05.8	73 26.3	·· 18.9	309 51.5	·· 06.1	137 37.3	·· 44.3	71 56.6	·· 05.2	122 56.9	113	·10 28.8	−106
16	334 08.2	88 25.5	19.5	324 52.7	06.7	152 39.7	44.3	86 58.7	05.3	137 27.2	112	10 39.4	−105
17	349 10.7	103 24.7	20.1	339 53.9	07.3	167 42.0	44.2	102 00.9	05.3	151 57.4	112	10 49.9	−104
18	4 13.2	118 23.9	−20 20.7	354 55.1	+ 4 07.9	182 44.3	+ 0 44.2	117 03.1	−20 05.4	166 27.6	112	−11 00.3	−104
19	19 15.6	133 23.1	21.3	9 56.3	08.5	197 46.6	44.1	132 05.3	05.4	180 57.8	111	11 10.7	−103
20	34 18.1	148 22.3	21.9	24 57.5	09.1	212 48.9	44.1	147 07.4	05.5	195 27.9	112	11 21.0	−103
21	49 20.6	163 21.5	·· 22.5	39 58.8	·· 09.7	227 51.2	·· 44.0	162 09.6	·· 05.5	209 58.1	112	·11 31.3	−101
22	64 23.0	178 20.7	23.1	55 00.0	10.3	242 53.5	43.9	177 11.8	05.5	224 28.3	111	11 41.4	−102
23	79 25.5	193 19.9	23.7	70 01.2	10.9	257 55.8	43.9	192 13.9	05.6	238 58.4	112	11 51.6	−100
24	94 27.9	208 19.1	−20 24.2	85 02.4	+ 4 11.5	272 58.1	+ 0 43.8	207 16.1	−20 05.6	253 28.6	111	−12 01.6	−100
corr	−	− 8	− 7	+ 12	+ 6	+ 23	0	+ 21	0				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
23 00	180 15.5	−23 26.3	7	Acamar	315 50.2	−40 28.7
01	195 15.1	26.3	5	Achernar	335 58.0	−57 27.5
02	210 14.8	26.3	30	Acrux	173 56.7	−62 51.4
03	225 14.5	·· 26.2	19	Adhara	255 45.4	−28 54.8
04	240 14.2	26.2	10	Aldebaran	291 37.7	+16 25.4
05	255 13.9	26.2				
06	270 13.6	−23 26.2	32	Alioth	166 57.9	+56 11.2
07	285 13.3	26.1	34	Alkaid	153 32.4	+49 31.4
08	300 13.0	26.1	55	Al Na'ir	28 37.1	−47 10.3
09	315 12.7	·· 26.1	15	Alnilam	276 29.0	− 1 13.8
10	330 12.3	26.1	25	Alphard	218 37.5	− 8 28.4
11	345 12.0	26.0				
12	0 11.7	−23 26.0	41	Alphecca	126 47.2	+26 51.4
13	15 11.4	26.0	1	Alpheratz	358 27.3	+28 51.4
14	30 11.1	25.9	51	Altair	62 49.8	+ 8 45.3
15	45 10.8	·· 25.9	2	Ankaa	353 57.4	−42 32.5
16	60 10.5	25.9	42	Antares	113 18.6	−26 20.2
17	75 10.2	25.8				
18	90 09.9	−23 25.8	37	Arcturus	146 34.5	+19 24.2
19	105 09.5	25.7	43	Atria	108 59.0	−68 56.9
20	120 09.2	25.7	22	Avior	234 34.8	−59 22.2
21	135 08.9	·· 25.7	13	Bellatrix	279 17.1	+ 6 18.7
22	150 08.6	25.6	16	Betelg'se	271 46.8	+ 7 24.0
23	165 08.3	25.6				
			17	Canopus	264 14.4	−52 40.4
24 00	180 08.0	−23 25.5	12	Capella	281 36.6	+45 57.4
01	195 07.7	25.5	53	Deneb	50 00.7	+45 07.8
02	210 07.4	25.5	28	Denebola	183 16.8	+14 48.6
03	225 07.1	·· 25.4	4	Diphda	349 38.3	−18 13.4
04	240 06.7	25.4				
05	255 06.4	25.3	27	Dubhe	194 43.4	+61 58.6
06	270 06.1	−23 25.3	14	Elnath	279 05.8	+28 34.3
07	285 05.8	25.2	47	Eltanin	91 06.4	+51 29.7
08	300 05.5	25.2	54	Enif	34 28.9	+ 9 40.8
09	315 05.2	·· 25.1	56	Fomalhaut	16 10.8	−29 51.1
10	330 04.9	25.1				
11	345 04.6	25.0	31	Gacrux	172 48.2	−56 52.1
12	0 04.3	−23 25.0	29	Gienah	176 35.9	−17 18.2
13	15 03.9	24.9	35	Hadar	149 48.3	−60 09.8
14	30 03.6	24.9	6	Hamal	328 48.4	+23 15.7
15	45 03.3	·· 24.8	48	Kaus Aust.	84 40.4	−34 24.3
16	60 03.0	24.8				
17	75 02.7	24.7	40	Kochab	137 19.0	+74 19.6
18	90 02.4	−23 24.7	57	Markab	14 20.6	+14 58.6
19	105 02.1	24.6	8	Menkar	314 59.1	+ 3 55.3
20	120 01.8	24.6	36	Menkent	148 57.8	−36 09.4
21	135 01.5	·· 24.5	24	Miapl'dus	221 48.0	−69 32.3
22	150 01.1	24.4				
23	165 00.8	24.4	9	Mirfak	309 40.6	+49 42.7
			50	Nunki	76 51.1	−26 21.0
25 00	180 00.5	−23 24.3	52	Peacock	54 26.4	−56 52.5
01	195 00.2	24.2	21	Pollux	244 19.1	+28 07.7
02	209 59.9	24.2	20	Procyon	245 43.7	+ 5 20.1
03	224 59.6	·· 24.1				
04	239 59.3	24.1	46	R'alhague	96 46.1	+12 35.5
05	254 59.0	24.0	26	Regulus	208 28.4	+12 10.5
06	269 58.7	−23 23.9	11	Rigel	281 52.4	− 8 15.1
07	284 58.3	23.9	38	Rigil Kent.	140 50.0	−60 39.3
08	299 58.0	23.8	44	Sabik	103 01.5	−15 40.3
09	314 57.7	·· 23.7				
10	329 57.4	23.7	3	Schedar	350 28.8	+56 18.5
11	344 57.1	23.6	45	Shaula	97 19.9	−37 04.4
12	359 56.8	−23 23.5	18	Sirius	259 10.7	−16 39.4
13	14 56.5	23.4	33	Spica	159 16.0	−10 56.2
14	29 56.2	23.4	23	Suhail	223 23.3	−43 15.5
15	44 55.9	·· 23.3				
16	59 55.6	23.2	49	Vega	81 08.1	+38 44.7
17	74 55.2	23.1	39	Zub'g'bi	137 52.6	−15 51.8
18	89 54.9	−23 23.1				
19	104 54.6	23.0				
20	119 54.3	22.9				
21	134 54.0	·· 22.8				
22	149 53.7	22.8				
23	164 53.4	22.7				
24	179 53.1	−23 22.6				
code	—	+ 1				

Lat.	Sunrise	Twlt. begins	Moonrise 23	24	25	26
N °	h m	h m	h m	h m	h m	h m
72	▬	6 55	24 10	0 10	2 09	4 13
70	▬	6 46	24 05	0 05	1 56	3 48
68	▬	6 39	24 02	0 02	1 45	3 29
66	10 36	6 33	23 58	25 37	1 37	3 14
64	9 53	6 27	23 56	25 30	1 30	3 02
62	9 25	6 22	23 54	25 24	1 24	2 52
60	9 03	6 17	23 52	25 18	1 18	2 43
58	8 46	6 12	23 50	25 14	1 14	2 35
56	8 31	6 09	23 49	25 10	1 10	2 28
54	8 18	6 04	23 47	25 06	1 06	2 22
52	8 07	6 01	23 46	25 02	1 02	2 17
50	7 57	5 57	23 45	25 00	1 00	2 12
45	7 37	5 49	23 42	24 53	0 53	2 02
40	7 20	5 41	23 40	24 47	0 47	1 53
35	7 06	5 34	23 39	24 43	0 43	1 45
30	6 53	5 27	23 37	24 39	0 39	1 39
20	6 32	5 12	23 35	24 32	0 32	1 28
10	6 13	4 58	23 32	24 25	0 25	1 18
0	5 56	4 40	23 30	24 20	0 20	1 09
10	5 38	4 20	23 28	24 14	0 14	1 00
20	5 19	3 55	23 26	24 08	0 08	0 50
30	4 57	3 20	23 24	24 01	0 01	0 40
35	4 44	2 57	23 22	23 57	24 33	0 33
40	4 29	2 26	23 21	23 53	24 26	0 26
45	4 11	1 38	23 19	23 48	24 18	0 18
50	3 49	////	23 17	23 42	24 08	0 08
52	3 38	////	23 16	23 39	24 04	0 04
54	3 25	////	23 15	23 36	23 59	24 25
56	3 11	////	23 14	23 33	23 53	24 17
58	2 54	////	23 13	23 29	23 47	24 09
60	2 34	////	23 11	23 25	23 40	23 59
S						

Lat.	Sunset	Twlt. ends	Moonset 23	24	25	26
N °	h m	h m	h m	h m	h m	h m
72	▬	17 03	11 00	10 46	10 31	10 10
70	▬	17 12	11 01	10 54	10 46	10 37
68	▬	17 19	11 01	10 59	10 58	10 57
66	13 24	17 27	11 01	11 04	11 08	11 13
64	14 06	17 32	11 02	11 09	11 16	11 26
62	14 35	17 38	11 02	11 12	11 24	11 37
60	14 56	17 42	11 02	11 16	11 30	11 47
58	15 14	17 47	11 02	11 19	11 36	11 55
56	15 28	17 50	11 02	11 21	11 41	12 03
54	15 41	17 55	11 03	11 23	11 45	12 09
52	15 52	17 58	11 03	11 26	11 49	12 15
50	16 02	18 02	11 03	11 27	11 53	12 21
45	16 23	18 10	11 03	11 32	12 01	12 33
40	16 39	18 17	11 03	11 35	12 08	12 42
35	16 54	18 25	11 03	11 38	12 14	12 51
30	17 06	18 32	11 04	11 41	12 19	12 58
20	17 27	18 46	11 04	11 46	12 28	13 11
10	17 46	19 01	11 04	11 50	12 36	13 22
0	18 03	19 18	11 04	11 54	12 43	13 33
10	18 21	19 39	11 04	11 58	12 51	13 43
20	18 40	20 04	11 04	12 02	12 59	13 54
30	19 02	20 39	11 05	12 07	13 08	14 07
35	19 15	21 02	11 05	12 09	13 13	14 15
40	19 30	21 33	11 05	12 13	13 19	14 24
45	19 48	22 21	11 05	12 16	13 26	14 34
50	20 11	////	11 05	12 20	13 34	14 46
52	20 22	////	11 05	12 22	13 38	14 51
54	20 34	////	11 05	12 25	13 42	14 58
56	20 48	////	11 05	12 27	13 47	15 05
58	21 05	////	11 05	12 30	13 52	15 13
60	21 25	////	11 05	12 33	13 58	15 22
S						

GMT	Equation of Time (App.—Mean) 23	24	25
h	m s	m s	m s
0	+ 1 02.4	+ 0 32.6	+ 0 02.7
6	+ 0 55.0	+ 0 25.1	− 0 04.7
12	+ 0 47.5	+ 0 17.6	− 0 12.2
18	+ 0 40.0	+ 0 10.2	− 0 19.6
24	+ 0 32.6	+ 0 02.7	− 0 27.1

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
23	4 52	10 04	18 24	5 58	10 20
24	5 42	10 05	18 22	5 55	10 16
25	6 31	10 06	18 20	5 51	10 13
26	7 21	10 07	18 18	5 47	10 09

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.6	0.1	0.1
30	0.6	0.1	0.1
45	0.6	0.1	0.1
60	0.6	0.0	0.1
75	0.6	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	23	24	25
°	′	′	′
0	18.2	17.3	16.4
4	18.2	17.3	16.4
8	18.2	17.3	16.4
12	18.2	17.3	16.4
16	18.1	17.3	16.4
20	18.1	17.2	16.4
24	18.0	17.2	16.4
28	17.9	17.1	16.3
32	17.9	17.1	16.3
36	17.8	17.0	16.3
40	17.7	17.0	16.3
44	17.6	16.9	16.2
48	17.5	16.8	16.2
52	17.4	16.8	16.2
56	17.2	16.7	16.1
60	17.1	16.6	16.1
64	17.0	16.5	16.0
68	16.8	16.4	16.0
72	16.7	16.3	15.9
76	16.6	16.2	15.9
80	16.4	16.1	15.8
84	16.3	16.0	15.8
88	16.2	16.0	15.8
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	23	24	25
°	′	′	′
0	14.0	14.5	15.0
4	14.0	14.5	15.0
8	14.1	14.6	15.1
12	14.1	14.6	15.1
16	14.1	14.6	15.1
20	14.1	14.6	15.1
24	14.2	14.6	15.1
28	14.2	14.7	15.1
32	14.3	14.7	15.1
36	14.4	14.8	15.2
40	14.5	14.8	15.2
44	14.6	14.9	15.2
48	14.7	15.0	15.3
52	14.8	15.0	15.3
56	14.9	15.1	15.3
60	15.0	15.2	15.4
64	15.1	15.3	15.4
68	15.3	15.4	15.5
72	15.4	15.5	15.5
76	15.5	15.5	15.5
80	15.7	15.6	15.6
84	15.8	15.7	15.6
88	16.0	15.8	15.7
90	16.1	15.9	15.7

Subtract from table, back cover

Last Quarter 24
Christmas Day 25

GMT	♈ GHA	VENUS −3.4 GHA	VENUS −3.4 Dec.	MARS 0.2 GHA	MARS 0.2 Dec.	JUPITER −1.6 GHA	JUPITER −1.6 Dec.	SATURN 0.7 GHA	SATURN 0.7 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
26 0	94 27.9	208 19.1	−20 24.2	85 02.4	+ 4 11.5	272 58.1	+ 0 43.8	207 16.1	−20 05.6	253 28.6	111	−12 01.6	−100
1	109 30.4	223 18.3	24.8	100 03.6	12.1	288 00.4	43.8	222 18.3	05.7	267 58.7	111	12 11.6	− 99
2	124 32.9	238 17.5	25.4	115 04.8	12.7	303 02.7	43.7	237 20.5	05.7	282 28.8	111	12 21.5	− 98
3	139 35.3	253 16.7	·· 26.0	130 06.0	·· 13.3	318 05.0	·· 43.7	252 22.6	·· 05.7	296 58.9	111	·12 31.3	− 97
4	154 37.8	268 15.9	26.6	145 07.2	13.9	333 07.3	43.6	267 24.8	05.8	311 29.0	111	12 41.0	− 97
5	169 40.3	283 15.1	27.2	160 08.4	14.5	348 09.7	43.6	282 27.0	05.8	325 59.1	111	12 50.7	− 96
6	184 42.7	298 14.3	−20 27.8	175 09.6	+ 4 15.1	3 12.0	+ 0 43.5	297 29.1	−20 05.9	340 29.2	110	−13 00.3	− 95
7	199 45.2	313 13.5	28.4	190 10.8	15.7	18 14.3	43.5	312 31.3	05.9	354 59.2	110	13 09.8	− 95
8	214 47.7	328 12.7	28.9	205 12.0	16.3	33 16.6	43.4	327 33.5	06.0	9 29.2	111	13 19.3	− 94
9	229 50.1	343 11.9	·· 29.5	220 13.2	·· 16.9	48 18.9	·· 43.3	342 35.7	·· 06.0	23 59.3	110	·13 28.7	− 93
10	244 52.6	358 11.1	30.1	235 14.4	17.5	63 21.2	43.3	357 37.8	06.0	38 29.3	110	13 38.0	− 92
11	259 55.0	13 10.3	30.7	250 15.7	18.1	78 23.5	43.2	12 40.0	06.1	52 59.3	109	13 47.2	− 91
12	274 57.5	28 09.5	−20 31.3	265 16.9	+ 4 18.7	93 25.8	+ 0 43.2	27 42.2	−20 06.1	67 29.2	110	−13 56.3	− 91
13	290 00.0	43 08.7	31.8	280 18.1	19.4	108 28.1	43.1	42 44.4	06.2	81 59.2	110	14 05.4	− 90
14	305 02.4	58 07.9	32.4	295 19.3	20.0	123 30.5	43.1	57 46.5	06.2	96 29.2	109	14 14.4	− 89
15	320 04.9	73 07.1	·· 33.0	310 20.5	·· 20.6	138 32.8	·· 43.0	72 48.7	·· 06.2	110 59.1	109	·14 23.3	− 88
16	335 07.4	88 06.3	33.6	325 21.7	21.2	153 35.1	43.0	87 50.9	06.3	125 29.0	109	14 32.1	− 88
17	350 09.8	103 05.4	34.1	340 22.9	21.8	168 37.4	42.9	102 53.0	06.3	139 58.9	109	14 40.9	− 86
18	5 12.3	118 04.6	−20 34.7	355 24.1	+ 4 22.4	183 39.7	+ 0 42.9	117 55.2	−20 06.4	154 28.8	108	−14 49.5	− 86
19	20 14.8	133 03.8	35.3	10 25.3	23.0	198 42.0	42.8	132 57.4	06.4	168 58.6	109	14 58.1	− 85
20	35 17.2	148 03.0	35.9	25 26.5	23.6	213 44.3	42.8	147 59.6	06.5	183 28.5	108	15 06.6	− 84
21	50 19.7	163 02.2	·· 36.4	40 27.7	·· 24.2	228 46.6	·· 42.7	163 01.7	·· 06.5	197 58.3	108	·15 15.0	− 83
22	65 22.2	178 01.4	37.0	55 28.9	24.8	243 49.0	42.6	178 03.9	06.5	212 28.1	108	15 23.3	− 82
23	80 24.6	193 00.6	37.6	70 30.1	25.4	258 51.3	42.6	193 06.1	06.6	226 57.9	108	15 31.5	− 82
27 0	95 27.1	207 59.8	−20 38.1	85 31.3	+ 4 26.0	273 53.6	+ 0 42.5	208 08.3	−20 06.6	241 27.7	108	−15 39.7	− 80
1	110 29.5	222 59.0	38.7	100 32.5	26.6	288 55.9	42.5	223 10.4	06.7	255 57.5	107	15 47.7	− 80
2	125 32.0	237 58.2	39.3	115 33.7	27.2	303 58.2	42.4	238 12.6	06.7	270 27.2	107	15 55.7	− 79
3	140 34.5	252 57.3	·· 39.8	130 34.9	·· 27.8	319 00.5	·· 42.4	253 14.8	·· 06.7	284 56.9	107	·16 03.6	− 78
4	155 36.9	267 56.5	40.4	145 36.1	28.4	334 02.8	42.3	268 17.0	06.8	299 26.6	107	16 11.4	− 77
5	170 39.4	282 55.7	41.0	160 37.3	29.0	349 05.2	42.3	283 19.1	06.8	313 56.3	107	16 19.1	− 76
6	185 41.9	297 54.9	−20 41.5	175 38.5	+ 4 29.6	4 07.5	+ 0 42.2	298 21.3	−20 06.9	328 26.0	107	−16 26.7	− 75
7	200 44.3	312 54.1	42.1	190 39.7	30.2	19 09.8	42.2	313 23.5	06.9	342 55.7	106	16 34.2	− 75
8	215 46.8	327 53.3	42.6	205 40.9	30.8	34 12.1	42.1	328 25.7	07.0	357 25.3	106	16 41.7	− 73
9	230 49.3	342 52.5	·· 43.2	220 42.1	·· 31.4	49 14.4	·· 42.1	343 27.8	·· 07.0	11 54.9	106	·16 49.0	− 73
10	245 51.7	357 51.7	43.8	235 43.3	32.0	64 16.7	42.0	358 30.0	07.0	26 24.5	106	16 56.3	− 71
11	260 54.2	12 50.8	44.3	250 44.5	32.6	79 19.1	42.0	13 32.2	07.1	40 54.1	106	17 03.4	− 71
12	275 56.7	27 50.0	−20 44.9	265 45.7	+ 4 33.2	94 21.4	+ 0 41.9	28 34.3	−20 07.1	55 23.7	106	−17 10.5	− 70
13	290 59.1	42 49.2	45.4	280 46.9	33.9	109 23.7	41.9	43 36.5	07.2	69 53.3	105	17 17.5	− 68
14	306 01.6	57 48.4	46.0	295 48.1	34.5	124 26.0	41.8	58 38.7	07.2	84 22.8	105	17 24.3	− 68
15	321 04.0	72 47.6	·· 46.5	310 49.3	·· 35.1	139 28.3	·· 41.8	73 40.9	·· 07.2	98 52.3	105	·17 31.1	− 67
16	336 06.5	87 46.8	47.1	325 50.5	35.7	154 30.7	41.7	88 43.0	07.3	113 21.8	105	17 37.8	− 66
17	351 09.0	102 45.9	47.6	340 51.7	36.3	169 33.0	41.7	103 45.2	07.3	127 51.3	105	17 44.4	− 65
18	6 11.4	117 45.1	−20 48.2	355 52.9	+ 4 36.9	184 35.3	+ 0 41.6	118 47.4	−20 07.4	142 20.8	104	−17 50.9	− 64
19	21 13.9	132 44.3	48.7	10 54.1	37.5	199 37.6	41.6	133 49.6	07.4	156 50.2	105	17 57.3	− 63
20	36 16.4	147 43.5	49.3	25 55.3	38.1	214 39.9	41.5	148 51.7	07.4	171 19.7	104	18 03.6	− 62
21	51 18.8	162 42.7	·· 49.8	40 56.5	·· 38.7	229 42.3	·· 41.5	163 53.9	·· 07.5	185 49.1	104	·18 09.8	− 61
22	66 21.3	177 41.8	50.4	55 57.6	39.3	244 44.6	41.4	178 56.1	07.5	200 18.5	104	18 15.9	− 60
23	81 23.8	192 41.0	50.9	70 58.8	39.9	259 46.9	41.4	193 58.3	07.6	214 47.9	104	18 21.9	− 59
28 0	96 26.2	207 40.2	−20 51.4	86 00.0	+ 4 40.5	274 49.2	+ 0 41.3	209 00.4	−20 07.6	229 17.3	103	−18 27.8	− 58
1	111 28.7	222 39.4	52.0	101 01.2	41.1	289 51.5	41.3	224 02.6	07.7	243 46.6	104	18 33.6	− 57
2	126 31.1	237 38.6	52.5	116 02.4	41.7	304 53.9	41.2	239 04.8	07.7	258 16.0	103	18 39.3	− 56
3	141 33.6	252 37.7	·· 53.1	131 03.6	·· 42.3	319 56.2	·· 41.2	254 07.0	·· 07.7	272 45.3	104	·18 44.9	− 55
4	156 36.1	267 36.9	53.6	146 04.8	42.9	334 58.5	41.1	269 09.1	07.8	287 14.7	103	18 50.4	− 54
5	171 38.5	282 36.1	54.1	161 06.0	43.5	350 00.8	41.1	284 11.3	07.8	301 44.0	103	18 55.8	− 53
6	186 41.0	297 35.3	−20 54.7	176 07.2	+ 4 44.1	5 03.2	+ 0 41.0	299 13.5	−20 07.9	316 13.3	103	−19 01.1	− 52
7	201 43.5	312 34.4	55.2	191 08.4	44.7	20 05.5	41.0	314 15.7	07.9	330 42.6	102	19 06.3	− 51
8	216 45.9	327 33.6	55.8	206 09.6	45.3	35 07.8	40.9	329 17.8	07.9	345 11.8	103	19 11.4	− 50
9	231 48.4	342 32.8	·· 56.3	221 10.8	·· 45.9	50 10.1	·· 40.9	344 20.0	·· 08.0	359 41.1	103	·19 16.4	− 49
10	246 50.9	357 32.0	56.8	236 12.0	46.5	65 12.5	40.8	359 22.2	08.0	14 10.4	102	19 21.3	− 48
11	261 53.3	12 31.1	57.4	251 13.2	47.2	80 14.8	40.8	14 24.4	08.1	28 39.6	102	19 26.1	− 47
12	276 55.8	27 30.3	−20 57.9	266 14.4	+ 4 47.8	95 17.1	+ 0 40.7	29 26.5	−20 08.1	43 08.8	102	−19 30.8	− 46
13	291 58.3	42 29.5	58.4	281 15.5	48.4	110 19.4	40.7	44 28.7	08.1	57 38.0	103	19 35.4	− 44
14	307 00.7	57 28.7	58.9	296 16.7	49.0	125 21.8	40.6	59 30.9	08.2	72 07.3	102	19 39.8	− 44
15	322 03.2	72 27.8	·20 59.5	311 17.9	·· 49.6	140 24.1	·· 40.6	74 33.1	·· 08.2	86 36.5	102	·19 44.2	− 43
16	337 05.6	87 27.0	21 00.0	326 19.1	50.2	155 26.4	40.5	89 35.2	08.3	101 05.7	101	19 48.5	− 41
17	352 08.1	102 26.2	00.5	341 20.3	50.8	170 28.7	40.5	104 37.4	08.3	115 34.8	102	19 52.6	− 41
18	7 10.6	117 25.3	−21 01.0	356 21.5	+ 4 51.4	185 31.1	+ 0 40.4	119 39.6	−20 08.3	130 04.0	102	−19 56.7	− 39
19	22 13.0	132 24.5	01.6	11 22.7	52.0	200 33.4	40.4	134 41.8	08.4	144 33.2	102	20 00.6	− 39
20	37 15.5	147 23.7	02.1	26 23.9	52.6	215 35.7	40.4	149 44.0	08.4	159 02.4	101	20 04.5	− 37
21	52 18.0	162 22.9	·· 02.6	41 25.1	·· 53.2	230 38.0	·· 40.3	164 46.1	·· 08.5	173 31.5	102	·20 08.2	− 37
22	67 20.4	177 22.0	03.1	56 26.2	53.8	245 40.4	40.3	179 48.3	08.5	188 00.7	101	20 11.9	− 35
23	82 22.9	192 21.2	03.6	71 27.4	54.4	260 42.7	40.2	194 50.5	08.6	202 29.8	102	20 15.4	− 34
24	97 25.4	207 20.4	−21 04.2	86 28.6	+ 4 55.0	275 45.0	+ 0 40.2	209 52.7	−20 08.6	216 59.0	101	−20 18.8	− 33
Corr	−	− 8	− 5	+ 12	+ 7	+ 23	0	+ 22	− 1				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
26 0	179 53.1	−23 22.6	7	Acamar	315 50.2	−40 28.7
1	194 52.8	22.5	5	Achernar	335 58.0	−57 27.5
2	209 52.5	22.4	30	Acrux	173 56.7	−62 51.5
3	224 52.1	22.4	19	Adhara	255 45.4	−28 54.8
4	239 51.8	22.3	10	Aldebaran	291 37.7	+16 25.4
5	254 51.5	22.2				
6	269 51.2	−23 22.1	32	Alioth	166 57.9	+56 11.2
7	284 50.9	22.0	34	Alkaid	153 32.4	+49 31.4
8	299 50.6	21.9	55	Al Na'ir	28 37.1	−47 10.3
9	314 50.3	21.8	15	Alnilam	276 29.0	− 1 13.8
10	329 50.0	21.8	25	Alphard	218 37.4	− 8 28.4
11	344 49.7	21.7				
12	359 49.4	−23 21.6	41	Alphecca	126 47.2	+26 51.4
13	14 49.0	21.5	1	Alpheratz	358 27.4	+28 51.4
14	29 48.7	21.4	51	Altair	62 49.8	+ 8 45.3
15	44 48.4	21.3	2	Ankaa	353 57.4	−42 32.5
16	59 48.1	21.2	42	Antares	113 18.6	−26 20.2
17	74 47.8	21.1				
18	89 47.5	−23 21.0	37	Arcturus	146 34.5	+19 24.2
19	104 47.2	20.9	43	Atria	108 58.9	−68 56.9
20	119 46.9	20.8	22	Avior	234 34.8	−59 22.2
21	134 46.6	20.7	13	Bellatrix	279 17.1	+ 6 18.7
22	149 46.3	20.6	16	Betelg'se	271 46.8	+ 7 23.9
23	164 46.0	20.5				
			17	Canopus	264 14.4	−52 40.4
27 0	179 45.6	−23 20.4	12	Capella	281 36.6	+45 57.4
1	194 45.3	20.3	53	Deneb	50 00.7	+45 07.8
2	209 45.0	20.2	28	Denebola	183 16.8	+14 48.6
3	224 44.7	20.1	4	Diphda	349 38.3	−18 13.4
4	239 44.4	20.0				
5	254 44.1	19.9	27	Dubhe	194 43.3	+61 58.6
6	269 43.8	−23 19.8	14	Elnath	279 05.8	+28 34.3
7	284 43.5	19.7	47	Eltanin	91 06.4	+51 29.7
8	299 43.2	19.6	54	Enif	34 28.9	+ 9 40.8
9	314 42.9	19.5	56	Fomalhaut	16 10.8	−29 51.1
10	329 42.6	19.4				
11	344 42.3	19.3	31	Gacrux	172 48.1	−56 52.2
12	359 41.9	−23 19.2	29	Gienah	176 35.9	−17 18.2
13	14 41.6	19.0	35	Hadar	149 48.3	−60 09.8
14	29 41.3	18.9	6	Hamal	328 48.4	+23 15.7
15	44 41.0	18.8	48	Kaus Aust.	84 40.4	−34 24.3
16	59 40.7	18.7				
17	74 40.4	18.6	40	Kochab	137 18.9	+74 19.6
18	89 40.1	−23 18.5	57	Markab	14 20.6	+14 58.6
19	104 39.8	18.4	8	Menkar	314 59.1	+ 3 55.3
20	119 39.5	18.2	36	Menkent	148 57.7	−36 09.4
21	134 39.2	18.1	24	Miapl'dus	221 48.0	−69 32.3
22	149 38.9	18.0				
23	164 38.6	17.9	9	Mirfak	309 40.6	+49 42.8
			50	Nunki	76 51.1	−26 21.0
28 0	179 38.3	−23 17.8	52	Peacock	54 26.4	−56 52.5
1	194 37.9	17.7	21	Pollux	244 19.1	+28 07.7
2	209 37.6	17.5	20	Procyon	245 43.7	+ 5 20.0
3	224 37.3	17.4				
4	239 37.0	17.3	46	R'alhague	96 46.1	+12 35.5
5	254 36.7	17.2	26	Regulus	208 28.3	+12 10.5
6	269 36.4	−23 17.0	11	Rigel	281 52.4	− 8 15.1
7	284 36.1	16.9	38	Rigil Kent.	140 50.0	−60 39.3
8	299 35.8	16.8	44	Sabik	103 01.5	−15 40.3
9	314 35.5	16.7				
10	329 35.2	16.5	3	Schedar	350 28.8	+56 18.5
11	344 34.9	16.4	45	Shaula	97 19.8	−37 04.4
12	359 34.6	−23 16.3	18	Sirius	259 10.7	−16 39.5
13	14 34.3	16.1	33	Spica	159 16.0	−10 56.3
14	29 34.0	16.0	23	Suhail	223 23.3	−43 15.5
15	44 33.6	15.9				
16	59 33.3	15.7	49	Vega	81 08.1	+38 44.7
17	74 33.0	15.6	39	Zub'g'bi	137 52.5	−15 51.8
18	89 32.7	−23 15.5				
19	104 32.4	15.3				
20	119 32.1	15.2				
21	134 31.8	15.1				
22	149 31.5	14.9				
23	164 31.2	14.8				
24	179 30.9	−23 14.7				
code	—	+ 2				

Lat.	Sunrise	Twlt. begins	Moonrise 26	27	28	29
N °	h m	h m	h m	h m	h m	h m
72	▬	6 56	4 13	6 35	▬	▬
70	▬	6 47	3 48	5 44	7 56	▬
68	▬	6 39	3 29	5 13	6 56	8 31
66	10 34	6 34	3 14	4 50	6 21	7 42
64	9 53	6 28	3 02	4 32	5 56	7 11
62	9 25	6 22	2 52	4 17	5 37	6 48
60	9 04	6 18	2 43	4 04	5 21	6 30
58	8 46	6 13	2 35	3 54	5 08	6 14
56	8 32	6 10	2 28	3 45	4 56	6 01
54	8 19	6 06	2 22	3 36	4 46	5 50
52	8 08	6 02	2 17	3 29	4 37	5 40
50	7 58	5 59	2 12	3 22	4 29	5 31
45	7 38	5 50	2 02	3 08	4 12	5 12
40	7 21	5 42	1 53	2 57	3 58	4 56
35	7 07	5 35	1 45	2 47	3 46	4 43
30	6 54	5 29	1 39	2 38	3 36	4 32
20	6 33	5 14	1 28	2 23	3 19	4 13
10	6 15	4 59	1 18	2 11	3 03	3 56
0	5 57	4 42	1 09	1 59	2 49	3 40
10	5 40	4 21	1 00	1 47	2 35	3 24
20	5 21	3 56	0 50	1 34	2 20	3 08
30	4 59	3 22	0 40	1 20	2 03	2 49
35	4 46	2 58	0 33	1 11	1 53	2 38
40	4 31	2 27	0 26	1 02	1 41	2 25
45	4 13	1 39	0 18	0 51	1 28	2 10
50	3 51	////	0 08	0 38	1 12	1 51
52	3 40	////	0 04	0 32	1 04	1 43
54	3 28	////	24 25	0 25	0 56	1 33
56	3 13	////	24 17	0 17	0 46	1 22
58	2 57	////	24 09	0 09	0 36	1 10
60	2 37	////	23 59	24 23	0 23	0 55
S						

Lat.	Sunset	Twlt. ends	Moonset 26	27	28	29
N °	h m	h m	h m	h m	h m	h m
72	▬	17 06	10 10	9 33	▬	▬
70	▬	17 15	10 37	10 24	9 59	▬
68	▬	17 21	10 57	10 57	10 59	11 10
66	13 28	17 29	11 13	11 21	11 34	11 59
64	14 10	17 35	11 26	11 39	12 00	12 30
62	14 37	17 39	11 37	11 55	12 19	12 54
60	14 59	17 45	11 47	12 08	12 36	13 12
58	15 16	17 49	11 55	12 19	12 49	13 28
56	15 31	17 53	12 03	12 29	13 01	13 41
54	15 43	17 56	12 09	12 38	13 12	13 53
52	15 54	18 00	12 15	12 45	13 21	14 03
50	16 04	18 03	12 21	12 52	13 29	14 12
45	16 25	18 12	12 33	13 07	13 47	14 31
40	16 41	18 19	12 42	13 20	14 01	14 47
35	16 56	18 27	12 51	13 30	14 13	15 00
30	17 08	18 33	12 58	13 40	14 24	15 12
20	17 29	18 48	13 11	13 56	14 43	15 31
10	17 48	19 03	13 22	14 10	14 59	15 49
0	18 05	19 20	13 33	14 23	15 14	16 05
10	18 22	19 40	13 43	14 36	15 29	16 21
20	18 41	20 05	13 54	14 50	15 45	16 38
30	19 03	20 39	14 07	15 06	16 03	16 58
35	19 16	21 03	14 15	15 16	16 14	17 09
40	19 31	21 34	14 24	15 26	16 26	17 22
45	19 49	22 21	14 34	15 39	16 41	17 38
50	20 11	////	14 46	15 54	16 59	17 57
52	20 22	////	14 51	16 02	17 07	18 06
54	20 34	////	14 58	16 10	17 17	18 17
56	20 49	////	15 05	16 19	17 28	18 28
58	21 05	////	15 13	16 29	17 40	18 41
60	21 25	////	15 22	16 41	17 54	18 57
S						

GMT	Equation of Time (App.−Mean) 26	27	28
h	m s	m s	m s
0	− 0 27.1	− 0 56.8	− 1 26.4
6	− 0 34.5	− 1 04.2	− 1 33.8
12	− 0 42.0	− 1 11.6	− 1 41.1
18	− 0 49.4	− 1 19.0	− 1 48.5
24	− 0 56.8	− 1 26.4	− 1 55.8

GMT of Transit
Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
26	7 21	10 07	18 18	5 47	10 09
27	8 11	10 09	18 17	5 44	10 06
28	9 01	10 10	18 15	5 40	10 03
29	9 52	10 11	18 13	5 36	9 59

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.6	0.1	0.1
30	0.6	0.1	0.1
45	0.6	0.1	0.1
60	0.6	0.0	0.1
75	0.6	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	26	27	28
°	′	′	′
0	15.7	14.9	14.2
4	15.7	14.9	14.2
8	15.7	14.9	14.2
12	15.7	14.9	14.2
16	15.7	14.9	14.2
20	15.7	15.0	14.2
24	15.7	15.0	14.3
28	15.7	15.0	14.3
32	15.7	15.0	14.3
36	15.7	15.0	14.4
40	15.7	15.0	14.4
44	15.6	15.1	14.5
48	15.6	15.1	14.5
52	15.6	15.1	14.6
56	15.6	15.1	14.7
60	15.6	15.2	14.7
64	15.6	15.2	14.8
68	15.6	15.2	14.9
72	15.6	15.3	14.9
76	15.6	15.3	15.0
80	15.6	15.3	15.1
84	15.6	15.4	15.2
88	15.6	15.4	15.2
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	26	27	28
°	′	′	′
0	15.5	15.9	16.4
4	15.5	15.9	16.3
8	15.5	15.9	16.3
12	15.5	15.9	16.3
16	15.5	15.9	16.3
20	15.5	15.9	16.3
24	15.5	15.9	16.2
28	15.5	15.8	16.2
32	15.5	15.8	16.2
36	15.5	15.8	16.1
40	15.5	15.8	16.1
44	15.5	15.8	16.0
48	15.5	15.7	16.0
52	15.5	15.7	15.9
56	15.5	15.7	15.8
60	15.5	15.6	15.8
64	15.5	15.6	15.7
68	15.5	15.6	15.6
72	15.6	15.6	15.6
76	15.6	15.5	15.5
80	15.6	15.5	15.4
84	15.6	15.4	15.3
88	15.6	15.4	15.3
90			

Subtract from table, back cover

GMT	♈ GHA	VENUS −3.4 GHA	VENUS −3.4 Dec.	MARS 0.3 GHA	MARS 0.3 Dec.	JUPITER −1.7 GHA	JUPITER −1.7 Dec.	SATURN 0.7 GHA	SATURN 0.7 Dec.	MOON GHA	MOON code	MOON Dec.	MOON code
h	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		° ′	
29 0	97 25.4	207 20.4	−21 04.2	86 28.6	+ 4 55.0	275 45.0	+ 0 40.2	209 52.7	−20 08.6	216 59.0	101	−20 18.8	− 33
1	112 27.8	222 19.5	04.7	101 29.8	55.6	290 47.4	40.1	224 54.8	08.6	231 28.1	102	20 22.1	− 32
2	127 30.3	237 18.7	05.2	116 31.0	56.2	305 49.7	40.1	239 57.0	08.7	245 57.3	101	20 25.3	− 31
3	142 32.8	252 17.9	·· 05.7	131 32.2	·· 56.8	320 52.0	·· 40.0	254 59.2	·· 08.7	260 26.4	102	·20 28.4	− 30
4	157 35.2	267 17.0	06.2	146 33.4	57.4	335 54.3	40.0	270 01.4	08.8	274 55.6	101	20 31.4	− 29
5	172 37.7	282 16.2	06.7	161 34.6	58.0	350 56.7	39.9	285 03.5	08.8	289 24.7	101	20 34.3	− 28
6	187 40.1	297 15.4	−21 07.3	176 35.7	+ 4 58.6	5 59.0	+ 0 39.9	300 05.7	−20 08.8	303 53.8	102	−20 37.1	− 26
7	202 42.6	312 14.5	07.8	191 36.9	59.2	21 01.3	39.8	315 07.9	08.9	318 23.0	101	20 39.7	− 26
8	217 45.1	327 13.7	08.3	206 38.1	4 59.9	36 03.7	39.8	330 10.1	08.9	332 52.1	102	20 42.3	− 24
9	232 47.5	342 12.9	·· 08.8	221 39.3	· 5 00.5	51 06.0	·· 39.8	345 12.2	·· 09.0	347 21.3	101	·20 44.7	− 24
10	247 50.0	357 12.0	09.3	236 40.5	01.1	66 08.3	39.7	0 14.4	09.0	1 50.4	102	20 47.1	− 22
11	262 52.5	12 11.2	09.8	251 41.7	01.7	81 10.7	39.7	15 16.6	09.0	16 19.6	101	20 49.3	− 21
12	277 54.9	27 10.4	−21 10.3	266 42.9	+ 5 02.3	96 13.0	+ 0 39.6	30 18.8	−20 09.1	30 48.7	102	−20 51.4	− 21
13	292 57.4	42 09.5	10.8	281 44.0	02.9	111 15.3	39.6	45 21.0	09.1	45 17.9	101	20 53.5	− 19
14	307 59.9	57 08.7	11.3	296 45.2	03.5	126 17.6	39.5	60 23.1	09.2	59 47.0	102	20 55.4	− 18
15	323 02.3	72 07.9	·· 11.8	311 46.4	·· 04.1	141 20.0	·· 39.5	75 25.3	·· 09.2	74 16.2	102	·20 57.2	− 17
16	338 04.8	87 07.0	12.3	326 47.6	04.7	156 22.3	39.4	90 27.5	09.2	88 45.4	101	20 58.9	− 15
17	353 07.3	102 06.2	12.8	341 48.8	05.3	171 24.6	39.4	105 29.7	09.3	103 14.5	102	21 00.4	− 15
18	8 09.7	117 05.3	−21 13.3	356 50.0	+ 5 05.9	186 27.0	+ 0 39.3	120 31.8	−20 09.3	117 43.7	102	−21 01.9	− 14
19	23 12.2	132 04.5	13.8	11 51.1	06.5	201 29.3	39.3	135 34.0	09.4	132 12.9	102	21 03.3	− 12
20	38 14.6	147 03.7	14.3	26 52.3	07.1	216 31.6	39.3	150 36.2	09.4	146 42.1	103	21 04.5	− 12
21	53 17.1	162 02.8	·· 14.8	41 53.5	·· 07.7	231 34.0	·· 39.2	165 38.4	·· 09.4	161 11.4	102	·21 05.7	− 10
22	68 19.6	177 02.0	15.3	56 54.7	08.3	246 36.3	39.2	180 40.6	09.5	175 40.6	102	21 06.7	− 10
23	83 22.0	192 01.1	15.8	71 55.9	08.9	261 38.7	39.1	195 42.7	09.5	190 09.8	103	21 07.7	− 8
30 0	98 24.5	207 00.3	−21 16.3	86 57.1	+ 5 09.5	276 41.0	+ 0 39.1	210 44.9	−20 09.6	204 39.1	102	−21 08.5	− 7
1	113 27.0	221 59.5	16.8	101 58.2	10.1	291 43.3	39.0	225 47.1	09.6	219 08.3	103	21 09.2	− 6
2	128 29.4	236 58.6	17.3	116 59.4	10.7	306 45.7	39.0	240 49.3	09.6	233 37.6	103	21 09.8	− 5
3	143 31.9	251 57.8	·· 17.8	132 00.6	·· 11.4	321 48.0	·· 39.0	255 51.4	·· 09.7	248 06.9	103	·21 10.3	− 4
4	158 34.4	266 56.9	18.2	147 01.8	12.0	336 50.3	38.9	270 53.6	09.7	262 36.2	103	21 10.7	− 3
5	173 36.8	281 56.1	18.7	162 03.0	12.6	351 52.7	38.9	285 55.8	09.8	277 05.5	104	21 11.0	− 2
6	188 39.3	296 55.2	−21 19.2	177 04.1	+ 5 13.2	6 55.0	+ 0 38.8	300 58.0	−20 09.8	291 34.9	103	−21 11.2	− 1
7	203 41.7	311 54.4	19.7	192 05.3	13.8	21 57.3	38.8	316 00.2	09.8	306 04.2	104	21 11.3	+ 1
8	218 44.2	326 53.6	20.2	207 06.5	14.4	36 59.7	38.7	331 02.3	09.9	320 33.6	104	21 11.2	+ 1
9	233 46.7	341 52.7	·· 20.7	222 07.7	·· 15.0	52 02.0	·· 38.7	346 04.5	·· 09.9	335 03.0	104	·21 11.1	+ 3
10	248 49.1	356 51.9	21.2	237 08.8	15.6	67 04.4	38.7	1 06.7	10.0	349 32.4	104	21 10.8	+ 3
11	263 51.6	11 51.0	21.6	252 10.0	16.2	82 06.7	38.6	16 08.9	10.0	4 01.8	105	21 10.5	+ 5
12	278 54.1	26 50.2	−21 22.1	267 11.2	+ 5 16.8	97 09.0	+ 0 38.6	31 11.0	−20 10.0	18 31.3	105	−21 10.0	+ 6
13	293 56.5	41 49.3	22.6	282 12.4	17.4	112 11.4	38.5	46 13.2	10.1	33 00.8	105	21 09.4	+ 6
14	308 59.0	56 48.5	23.1	297 13.6	18.0	127 13.7	38.5	61 15.4	10.1	47 30.3	105	21 08.8	+ 8
15	324 01.5	71 47.6	·· 23.5	312 14.7	·· 18.6	142 16.1	·· 38.4	76 17.6	·· 10.2	61 59.8	105	·21 08.0	+ 9
16	339 03.9	86 46.8	24.0	327 15.9	19.2	157 18.4	38.4	91 19.8	10.2	76 29.3	106	21 07.1	+ 10
17	354 06.4	101 45.9	24.5	342 17.1	19.8	172 20.7	38.4	106 21.9	10.2	90 58.9	106	21 06.1	+ 11
18	9 08.9	116 45.1	−21 25.0	357 18.3	+ 5 20.4	187 23.1	+ 0 38.3	121 24.1	−20 10.3	105 28.5	106	−21 05.0	+ 12
19	24 11.3	131 44.2	25.4	12 19.4	21.0	202 25.4	38.3	136 26.3	10.3	119 58.1	107	21 03.8	+ 13
20	39 13.8	146 43.4	25.9	27 20.6	21.6	217 27.8	38.2	151 28.5	10.4	134 27.8	106	21 02.5	+ 14
21	54 16.2	161 42.5	·· 26.4	42 21.8	·· 22.2	232 30.1	·· 38.2	166 30.7	·· 10.4	148 57.4	107	·21 01.1	+ 15
22	69 18.7	176 41.7	26.9	57 23.0	22.9	247 32.4	38.2	181 32.8	10.4	163 27.1	108	20 59.6	+ 16
23	84 21.2	191 40.8	27.3	72 24.1	23.5	262 34.8	38.1	196 35.0	10.5	177 56.9	107	20 58.0	+ 17
31 0	99 23.6	206 40.0	−21 27.8	87 25.3	+ 5 24.1	277 37.1	+ 0 38.1	211 37.2	−20 10.5	192 26.6	108	−20 56.3	+ 19
1	114 26.1	221 39.1	28.3	102 26.5	24.7	292 39.5	38.0	226 39.4	10.5	206 56.4	108	20 54.4	+ 19
2	129 28.6	236 38.3	28.7	117 27.7	25.3	307 41.8	38.0	241 41.6	10.6	221 26.2	109	20 52.5	+ 20
3	144 31.0	251 37.4	·· 29.2	132 28.8	·· 25.9	322 44.1	·· 38.0	256 43.7	·· 10.6	235 56.1	109	·20 50.5	+ 21
4	159 33.5	266 36.6	29.6	147 30.0	26.5	337 46.5	37.9	271 45.9	10.7	250 26.0	109	20 48.4	+ 22
5	174 36.0	281 35.7	30.1	162 31.2	27.1	352 48.8	37.9	286 48.1	10.7	264 55.9	109	20 46.2	+ 24
6	189 38.4	296 34.9	−21 30.6	177 32.4	+ 5 27.7	7 51.2	+ 0 37.8	301 50.3	−20 10.7	279 25.8	110	−20 43.8	+ 24
7	204 40.9	311 34.0	31.0	192 33.5	28.3	22 53.5	37.8	316 52.5	10.8	293 55.8	110	20 41.4	+ 25
8	219 43.4	326 33.2	31.5	207 34.7	28.9	37 55.9	37.8	331 54.6	10.8	308 25.8	110	20 38.9	+ 27
9	234 45.8	341 32.3	·· 31.9	222 35.9	·· 29.5	52 58.2	·· 37.7	346 56.8	·· 10.9	322 55.8	111	·20 36.2	+ 27
10	249 48.3	356 31.5	32.4	237 37.1	30.1	68 00.6	37.7	1 59.0	10.9	337 25.9	111	20 33.5	+ 28
11	264 50.7	11 30.6	32.9	252 38.2	30.7	83 02.9	37.6	17 01.2	10.9	351 56.0	112	20 30.7	+ 29
12	279 53.2	26 29.8	−21 33.3	267 39.4	+ 5 31.3	98 05.2	+ 0 37.6	32 03.4	−20 11.0	6 26.2	112	−20 27.8	+ 30
13	294 55.7	41 28.9	33.8	282 40.6	31.9	113 07.6	37.6	47 05.5	11.0	20 56.4	112	20 24.8	+ 32
14	309 58.1	56 28.0	34.2	297 41.7	32.5	128 09.9	37.5	62 07.7	11.1	35 26.6	113	20 21.6	+ 32
15	325 00.6	71 27.2	·· 34.7	312 42.9	·· 33.1	143 12.3	·· 37.5	77 09.9	·· 11.1	49 56.9	112	·20 18.4	+ 33
16	340 03.1	86 26.3	35.1	327 44.1	33.7	158 14.6	37.4	92 12.1	11.1	64 27.1	114	20 15.1	+ 34
17	355 05.5	101 25.5	35.6	342 45.3	34.4	173 17.0	37.4	107 14.3	11.2	78 57.5	114	20 11.7	+ 35
18	10 08.0	116 24.6	−21 36.0	357 46.4	+ 5 35.0	188 19.3	+ 0 37.4	122 16.4	−20 11.2	93 27.9	114	−20 08.2	+ 36
19	25 10.5	131 23.8	36.5	12 47.6	35.6	203 21.7	37.3	137 18.6	11.3	107 58.3	114	20 04.6	+ 37
20	40 12.9	146 22.9	36.9	27 48.8	36.2	218 24.0	37.3	152 20.8	11.3	122 28.7	115	20 00.9	+ 37
21	55 15.4	161 22.0	·· 37.3	42 49.9	·· 36.8	233 26.4	·· 37.3	167 23.0	·· 11.3	136 59.2	116	·19 57.2	+ 39
22	70 17.8	176 21.2	37.8	57 51.1	37.4	248 28.7	37.2	182 25.2	11.4	151 29.8	115	19 53.3	+ 40
23	85 20.3	191 20.3	38.2	72 52.3	38.0	263 31.1	37.2	197 27.3	11.4	166 00.3	117	19 49.3	+ 41
24	100 22.8	206 19.5	−21 38.7	87 53.4	+ 5 38.6	278 33.4	+ 0 37.1	212 29.5	−20 11.5	180 31.0	116	−19 45.2	+ 41
code	—	− 9	− 5	+ 12	+ 6	+ 24	− 1	+ 22	− 1				

GMT	SUN GHA	SUN Dec.	STARS No.	Name	SHA	Dec.
h	° ′	° ′			° ′	° ′
29 00	179 30.9	−23 14.7	7	Acamar	315 50.2	−40 28.7
01	194 30.6	14.5	5	Achernar	335 58.1	−57 27.5
02	209 30.3	14.4	30	Acrux	173 56.6	−62 51.5
03	224 30.0	·· 14.2	19	Adhara	255 45.4	−28 54.9
04	239 29.7	14.1	10	Aldebaran	291 37.7	+16 25.4
05	254 29.4	14.0				
06	269 29.1	−23 13.8	32	Alioth	166 57.9	+56 11.2
07	284 28.8	13.7	34	Alkaid	153 32.4	+49 31.3
08	299 28.5	13.5	55	Al Na'ir	28 37.1	−47 10.3
09	314 28.1	·· 13.4	15	Alnilam	276 29.0	− 1 13.8
10	329 27.8	13.2	25	Alphard	218 37.4	− 8 28.4
11	344 27.5	13.1				
12	359 27.2	−23 12.9	41	Alphecca	126 47.1	+26 51.4
13	14 26.9	12.8	1	Alpheratz	358 27.4	+28 51.4
14	29 26.6	12.6	51	Altair	62 49.8	+ 8 45.3
15	44 26.3	·· 12.5	2	Ankaa	353 57.4	−42 32.5
16	59 26.0	12.3	42	Antares	113 18.5	−26 20.2
17	74 25.7	12.2				
18	89 25.4	−23 12.0	37	Arcturus	146 34.5	+19 24.2
19	104 25.1	11.9	43	Atria	108 58.9	−68 56.9
20	119 24.8	11.7	22	Avior	234 34.7	−59 22.2
21	134 24.5	·· 11.6	13	Bellatrix	279 17.1	+ 6 18.7
22	149 24.2	11.4	16	Betelg'se	271 46.8	+ 7 23.9
23	164 23.9	11.2				
			17	Canopus	264 14.4	−52 40.4
30 00	179 23.6	−23 11.1	12	Capella	281 36.6	+45 57.4
01	194 23.3	10.9	53	Deneb	50 00.7	+45 07.8
02	209 23.0	10.8	28	Denebola	183 16.7	+14 48.5
03	224 22.7	·· 10.6	4	Diphda	349 38.3	−18 13.4
04	239 22.4	10.4				
05	254 22.1	10.3	27	Dubhe	194 43.3	+61 58.6
06	269 21.8	−23 10.1	14	Elnath	279 05.8	+28 34.3
07	284 21.5	09.9	47	Eltanin	91 06.4	+51 29.6
08	299 21.2	09.8	54	Enif	34 28.9	+ 9 40.8
09	314 20.9	·· 09.6	56	Fomalhaut	16 10.8	−29 51.1
10	329 20.6	09.4				
11	344 20.3	09.3	31	Gacrux	172 48.1	−56 52.2
12	359 20.0	−23 09.1	29	Gienah	176 35.9	−17 18.2
13	14 19.7	08.9	35	Hadar	149 48.3	−60 09.8
14	29 19.4	08.8	6	Hamal	328 48.4	+23 15.7
15	44 19.0	·· 08.6	48	Kaus Aust.	84 40.4	−34 24.3
16	59 18.7	08.4				
17	74 18.4	08.3	40	Kochab	137 18.9	+74 19.6
18	89 18.1	−23 08.1	57	Markab	14 20.6	+14 58.6
19	104 17.8	07.9	8	Menkar	314 59.1	+ 3 55.3
20	119 17.5	07.7	36	Menkent	148 57.7	−36 09.4
21	134 17.2	·· 07.6	24	Miapl'dus	221 48.0	−69 32.3
22	149 16.9	07.4				
23	164 16.6	07.2	9	Mirfak	309 40.6	+49 42.8
			50	Nunki	76 51.1	−26 21.0
31 00	179 16.3	−23 07.0	52	Peacock	54 26.4	−56 52.5
01	194 16.0	06.9	21	Pollux	244 19.1	+28 07.7
02	209 15.7	06.7	20	Procyon	245 43.7	+ 5 20.0
03	224 15.4	·· 06.5				
04	239 15.1	06.3	46	R'alhague	96 46.1	+12 35.4
05	254 14.8	06.1	26	Regulus	208 28.3	+12 10.5
06	269 14.5	−23 05.9	11	Rigel	281 52.4	− 8 15.1
07	284 14.2	05.8	38	Rigil Kent.	140 49.9	−60 39.3
08	299 13.9	05.6	44	Sabik	103 01.4	−15 40.3
09	314 13.6	·· 05.4				
10	329 13.3	05.2	3	Schedar	350 28.8	+56 18.5
11	344 13.0	05.0	45	Shaula	97 19.8	−37 04.3
12	359 12.7	−23 04.8	18	Sirius	259 10.7	−16 39.5
13	14 12.4	04.6	33	Spica	159 16.0	−10 56.3
14	29 12.1	04.5	23	Suhail	223 23.2	−43 15.5
15	44 11.8	·· 04.3				
16	59 11.5	04.1	49	Vega	81 08.1	+38 44.6
17	74 11.2	03.9	39	Zub'g'bi	137 52.5	−15 51.8
18	89 10.9	−23 03.7				
19	104 10.6	03.5				
20	119 10.4	03.3				
21	134 10.1	·· 03.1				
22	149 09.8	02.9				
23	164 09.5	02.7				
24	179 09.2	−23 02.5				
code	—	+ 2				

Lat.	Sunrise	Twlt. begins	Moonrise 29	30	31	1
N °	h m	h m	h m	h m	h m	h m
72	▬	6 55	▬	▬	▬	▬
70	▬	6 46	▬	▬	▬	11 04
68	▬	6 39	8 31	9 40	10 06	10 13
66	10 31	6 33	7 42	8 44	9 21	9 41
64	9 51	6 28	7 11	8 10	8 51	9 18
62	9 24	6 23	6 48	7 46	8 29	8 59
60	9 03	6 18	6 30	7 27	8 11	8 43
58	8 46	6 14	6 14	7 11	7 55	8 30
56	8 32	6 10	6 01	6 57	7 43	8 19
54	8 19	6 06	5 50	6 45	7 31	8 09
52	8 08	6 02	5 40	6 35	7 21	8 00
50	7 59	6 00	5 31	6 25	7 12	7 52
45	7 38	5 51	5 12	6 06	6 54	7 35
40	7 22	5 43	4 56	5 50	6 38	7 21
35	7 08	5 36	4 43	5 36	6 25	7 09
30	6 55	5 30	4 32	5 25	6 14	6 59
20	6 34	5 15	4 13	5 05	5 54	6 41
10	6 16	5 01	3 56	4 47	5 37	6 25
0	5 59	4 43	3 40	4 31	5 21	6 10
10	5 42	4 23	3 24	4 15	5 06	5 56
20	5 23	3 58	3 08	3 58	4 49	5 40
30	5 01	3 24	2 49	3 38	4 29	5 22
35	4 48	3 01	2 38	3 26	4 18	5 12
40	4 33	2 31	2 25	3 13	4 05	5 00
45	4 15	1 44	2 10	2 57	3 49	4 45
50	3 53	////	1 51	2 38	3 30	4 28
52	3 43	////	1 43	2 29	3 21	4 20
54	3 30	////	1 33	2 18	3 11	4 11
56	3 16	////	1 22	2 07	3 00	4 00
58	3 00	////	1 10	1 53	2 47	3 48
60	2 40	////	0 55	1 38	2 31	3 35
S						

Lat.	Sunset	Twlt. ends	Moonset 29	30	31	1
N °	h m	h m	h m	h m	h m	h m
72	▬	17 09	▬	▬	▬	▬
70	▬	17 18	▬	▬	▬	13 49
68	▬	17 24	11 10	11 48	13 06	14 39
66	13 34	17 32	11 59	12 44	13 50	15 10
64	14 14	17 37	12 30	13 17	14 20	15 33
62	14 41	17 42	12 54	13 41	14 42	15 52
60	15 02	17 47	13 12	14 01	15 00	16 07
58	15 19	17 51	13 28	14 17	15 15	16 20
56	15 34	17 56	13 41	14 30	15 27	16 31
54	15 46	17 59	13 53	14 42	15 38	16 40
52	15 57	18 02	14 03	14 53	15 48	16 49
50	16 07	18 06	14 12	15 02	15 57	16 57
45	16 27	18 13	14 31	15 21	16 16	17 13
40	16 44	18 21	14 47	15 37	16 31	17 27
35	16 58	18 29	15 00	15 50	16 43	17 38
30	17 10	18 35	15 12	16 02	16 54	17 48
20	17 31	18 50	15 31	16 22	17 13	18 05
10	17 49	19 04	15 49	16 39	17 30	18 20
0	18 06	19 21	16 05	16 56	17 45	18 33
10	18 24	19 42	16 21	17 12	18 01	18 47
20	18 42	20 06	16 38	17 29	18 17	19 02
30	19 04	20 40	16 58	17 49	18 36	19 18
35	19 17	21 03	17 09	18 00	18 46	19 28
40	19 32	21 34	17 22	18 13	18 59	19 39
45	19 50	22 21	17 38	18 29	19 14	19 52
50	20 12	////	17 57	18 48	19 32	20 08
52	20 22	////	18 06	18 57	19 40	20 15
54	20 34	////	18 17	19 08	19 49	20 23
56	20 48	////	18 28	19 19	20 00	20 32
58	21 05	////	18 41	19 32	20 12	20 42
60	21 25	////	18 57	19 48	20 26	20 54
S						

GMT	Equation of Time (App. − Mean) 29	30	31
h	m s	m s	m s
0	− 1 55.8	− 2 25.1	− 2 54.1
6	− 2 03.2	− 2 32.3	− 3 01.3
12	− 2 10.5	− 2 39.6	− 3 08.4
18	− 2 17.8	− 2 46.8	− 3 15.6
24	− 2 25.1	− 2 54.1	− 3 22.8

GMT of Transit Meridian of Greenwich

DAY	Moon	Venus	Mars	Jupiter	Saturn
	h m	h m	h m	h m	h m
29	9 52	10 11	18 13	5 36	9 59
30	10 43	10 13	18 11	5 32	9 56
31	11 33	10 14	18 09	5 29	9 52
1	12 22	10 15	18 07	5 25	9 49

ADDITIONAL ALTITUDE CORRECTIONS

Alt.	Sun's Low'r Limb Add	Venus Add	Mars Add
°	′	′	′
0	0.6	0.1	0.1
30	0.6	0.1	0.1
45	0.6	0.1	0.1
60	0.6	0.0	0.1
75	0.6	0.0	0.0
90			

Moon's Lower Limb **Add**

Alt.	29	30	31
°	′	′	′
0	13.6	13.0	12.6
4	13.7	13.0	12.6
8	13.7	13.0	12.7
12	13.7	13.1	12.7
16	13.7	13.1	12.7
20	13.8	13.2	12.8
24	13.8	13.2	12.9
28	13.8	13.3	12.9
32	13.9	13.3	13.0
36	14.0	13.4	13.1
40	14.0	13.5	13.2
44	14.1	13.6	13.3
48	14.2	13.7	13.4
52	14.3	13.8	13.6
56	14.3	13.9	13.7
60	14.4	14.1	13.8
64	14.5	14.2	14.0
68	14.6	14.3	14.1
72	14.7	14.5	14.3
76	14.8	14.6	14.4
80	14.9	14.7	14.6
84	15.0	14.9	14.8
88	15.1	15.0	14.9
90			

Add to table, back cover

Moon's Upper Limb **Subtract**

Alt.	29	30	31
°	′	′	′
0	16.6	17.0	17.2
4	16.6	17.0	17.2
8	16.6	17.0	17.2
12	16.6	16.9	17.2
16	16.6	16.9	17.1
20	16.5	16.9	17.1
24	16.5	16.8	17.0
28	16.4	16.7	16.9
32	16.4	16.7	16.8
36	16.3	16.6	16.7
40	16.3	16.5	16.6
44	16.2	16.4	16.5
48	16.1	16.3	16.4
52	16.0	16.2	16.3
56	15.9	16.1	16.1
60	15.8	15.9	16.0
64	15.8	15.8	15.9
68	15.7	15.7	15.7
72	15.6	15.6	15.6
76	15.5	15.4	15.4
80	15.4	15.3	15.2
84	15.2	15.1	15.1
88	15.2	15.0	15.0
90			

Subtract from table, back cover

EXPLANATION AND EXAMPLES

1. Object. The object of this volume is to provide in convenient form the astronomical data required by mariners. In the front part of the book two facing pages give complete data for every hour of three days. The yellow pages give 60 tables, one for every minute of the hour. Each table has two parts. One part (consisting of the first four columns) has 61 lines, one for every second of the minute, used to bring the hourly value of the Greenwich hour angle (GHA) up to the minute and second of observation. The other part (making up the last three columns), with 181 values, is for use in bringing the hourly value of the declination up to the minute of observation; and also for obtaining small corrections to the GHA of the planets and Moon. Altitude correction tables are on the covers, and small additional altitude corrections for the Sun, Moon, Venus, and Mars are on the daily pages.

2. Sun, Moon, planets, and *Vernal equinox* (♈). The daily pages give the GHA and Dec. of the Sun, Moon, and four planets at 1-hour intervals, and also a code at the foot of the column (at the right for the Moon) to be used with the yellow table, except for the GHA of the Sun and (♈), where no code is needed. The sign of the code correction is the sign attached to the code on the daily pages; for the Moon's GHA the sign (not printed) is always plus. The magnitudes of the planets are given in the headings.

Example: For 1956 January 4, $16^h\ 23^m\ 12^s$, Greenwich mean time, find the GHA and Dec. of the Sun.

	GHA	Dec.	code
	° ′	° ′	
(From daily page for Jan. 4, 5, 6) Jan. 4, 16^h	58 49.1	−22 46.9	+3
(From yellow table 23^m, Sun, 12^s) $23^m\ 12^s$	5 48.0		
(From yellow table 23^m, code 3) code correction		+0.1	
The required GHA and Dec.	64 37.1	−22 46.8	

Example: For 1956 January 5, $9^h\ 12^m\ 49^s$ GMT, find the GHA and Dec. of Venus.

	GHA	code	Dec.	code
	° ′		° ′	
(From daily page for Jan. 4, 5, 6) Jan. 5, 9^h	280 58.9	−6	−18 02.2	+9
(From yellow table 12^m, planets, 49^s) $12^m\ 49^s$	3 12.3			
(From yellow table 12^m, codes 6 and 9) code correction	−0.1		+0.2	
The required GHA and Dec.	284 11.1		−18 02.0	

Example: For 1956 January 6, $14^h\ 14^m\ 27^s$ GMT, find the GHA and Dec. of the Moon.

	GHA	code	Dec.	code
	° ′		° ′	
(From daily page for Jan. 4, 5, 6) Jan. 6, 14^h	104 32.2	+128	−16 15.9	−85
(From yellow table 14^m, Moon, 27^s) $14^m\ 27^s$	3 26.9			
(From yellow table 14^m, codes 128 and 85) code correction	+3.1		−2.1	
The required GHA and Dec.	108 02.2		−16 18.0	

3. Stars. The GHA of a star is found by adding the GHA of the vernal equinox to the star's sidereal hour angle:

$$\text{GHA}* = \text{GHA}\Upsilon + \text{SHA}*.$$

On the right-hand daily pages are given the SHA, Dec., and names of 57 stars. The data are for the middle of the second day. The SHA and Dec. may be used without appreciable error for three days. The names and magnitudes of the stars are given inside the front cover, and also on the outside of the back cover.

Example: For 1956 January 8, $18^h\ 44^m\ 19^s$ GMT, find the GHA and Dec. of star 12, Capella.

	GHA	Dec.
	° ′	° ′
(From daily page for Jan. 7, 8, 9) SHA and Dec.	281 37.6	+45 57.4
(From daily page for Jan. 7, 8, 9) GHA ♈, Jan. 8, 18^h	17 16.3	
(From yellow table 44^m, ♈, 19^s) $44^m\ 19^s$	11 06.6	
The required GHA	310 00.5	

The Greenwich mean time of transit over the meridian of Greenwich may be obtained, if desired, by finding the GMT at which GHA♈ is the same as 360°−SHA*.

The SHA, Dec., and magnitude of 172 stars (including the 57 standard stars) are given for the middle of each month on pages 254–259.

4. Altitude Corrections. Three altitude corrections are given, except for the stars, Jupiter, and Saturn, where only two are needed. The correction for *height of eye*, used for all objects observed with a marine sextant, is inside the front cover. For the *Sun's lower limb*, use also the correction from the Sun table inside the front cover and add the small additional correction from the daily page. For *stars* and *planets*, use (in addition to the dip correction) the correction from the star and planet table inside the front cover, and for *Venus* and *Mars* add the small additional correction from the daily page. For the *Moon*, use (in addition to the dip correction) the correction from the Moon table inside the back cover and apply the additional limb correction from the daily page; the limb corrections are given for 12^h GMT of each day, and may be taken directly out of the table without interpolation.

Example: Correct the following observed altitudes, taken at height 35 feet on 1956 January 8.

	Sun (lower limb)	Moon (upper limb)	Moon (lower limb)	Venus	Polaris
	° ′	° ′	° ′	° ′	° ′
Observed altitude	24 16.2	38 16.5	37 58.2	25 14.6	40 13.2
Height of eye	− 5.6	− 5.6	− 5.6	−5.6	−5.6
Cover tables	+13.7	+43.5	+43.7	−2.0	−1.1
(From daily page) additional correction	+ 0.6	−16.9	+12.8	+0.1	
Corrected altitude	24 24.9	38 37.5	38 49.1	25 07.1	40 06.5

Caution. In H. O. 218 and in the preliminary edition of H. O. 249, refraction at a height of eye of 5000 feet is already included, and the altitude corrections in this book are not to be used.

Sun's upper limb and *Bubble sextant observations.* If the upper limb of the Sun is observed, correct the altitude as if the lower limb had been observed, and apply the additional correction from the table below.

ADDITIONAL CORRECTION FOR SUN'S UPPER LIMB

(to be applied to the correction for the lower limb)

Dates	Correction	Dates
	′	
Jan. 2 to Jan. 27	−33.8	Dec. 11 to Dec. 31
Jan. 28 to Feb. 15	−33.7	Nov. 22 to Dec. 10
Feb. 16 to Feb. 29	−33.6	Nov. 8 to Nov. 21
Mar. 1 to Mar. 11	−33.5	Oct. 27 to Nov. 7
Mar. 12 to Mar. 23	−33.4	Oct. 16 to Oct. 26
Mar. 24 to Apr. 2	−33.3	Oct. 5 to Oct. 15
Apr. 3 to Apr. 13	−33.2	Sept. 24 to Oct. 4
Apr. 14 to Apr. 25	−33.1	Sept. 13 to Sept. 23
Apr. 26 to May 7	−33.0	Aug. 31 to Sept. 12
May 8 to May 23	−32.9	Aug. 16 to Aug. 30
May 24 to June 14	−32.8	July 24 to Aug. 15
June 15 to July 23	−32.7	

If the center of the Sun or Moon is observed with a bubble sextant, calculate the correction for the two limbs separately, and take the average of the two results; in the case of the Sun, add 0.′6 to this average. Do not apply correction for height of eye to bubble sextant observations.

5. Latitude from Polaris. The tables on the last white page and the first yellow page give three corrections which must be applied to a corrected altitude of Polaris to get the latitude. All three tables depend on the local hour angle of the vernal equinox. The second table depends also on the date and the third on the corrected altitude.

Example: On 1956 January 8, $13^h\ 45^m\ 35^s$ GMT in longitude 74° West the observed altitude of Polaris was 40° 13.′2. Find the latitude.

	° ′
(From the daily page for Jan. 7, 8, 9) GHA ♈, Jan. 8, 13^h	302 04.0
(From yellow table 45^m, ♈, 35^s) 45^m 35^s	11 25.6
GHA ♈	313 29.6
Longitude west (subtract)	74 00.0
LHA ♈	239 29.6

	° ′
Corrected altitude (from example of section 4)	40 06.5
Correction for LHA ♈, 239°.5	+48.4
Correction for LHA ♈ and date	− 0.1
Correction for LHA ♈ and corrected altitude	0.0
Latitude	40 54.8

The page preceding the other Polaris tables gives the azimuth, depending on LHA ♈ and the latitude.

6. Sunrise, sunset, twilight, moonrise, moonset. Data for finding these for latitudes between 60° south and 72° north are given on the right-hand daily pages. Sunrise, sunset, and the beginning and ending of astronomical twilight are given for the middle day; they are sufficiently accurate for three days. Moonrise and moonset are given for four days for the Greenwich meridian in order to facilitate estimation of times for other longitudes. All times in these columns are local mean times. The precise time of moonrise or moonset is seldom needed; a glance at the table will usually show whether the Moon is up, and favorably placed for observation. If needed, however, the precise time may be obtained as follows. Interpolate for latitude on the day wanted, and also on the preceding day in east longitudes, or the following day in west longitudes. Take the difference between the two results, multiply it by the longitude divided by 360°, and apply the product to the datum for the day wanted, so as to bring the result between the two results previously found.

Example: Find the time of moonrise on 1956 January 3, in longitude 60° west, latitude 42° north.

	h m
January 3, Greenwich, latitude 42° north	23 24
January 4, Greenwich, latitude 42° north	24 29
Difference	65
Correction for longitude, $\frac{60}{360}\times 65$	11
Local mean time of moonrise	23 35
GMT of moonrise ($60°=4^h$)	27 35

The times of moonrise and moonset are sometimes greater than 24^h. This means that the phenomenon really occurs on the following day but the time is given in this form to facilitate the interpolation. For any given meridian the time of moonrise or moonset is about an hour later (on the average) each succeeding day. If then, on a given day, one of these phenomena occurs shortly before midnight, the next one will occur about 25 hours later which carries it over into the second day.

Some of the phenomena do not occur in high latitudes during certain periods. The symbols used to indicate the exceptions are:

□, Sun or Moon does not set but remains continuously above the horizon.

■, Sun or Moon does not rise but remains continuously below the horizon.

////, Twilight lasts all night.

7. *Equation of time.* This is given on the right-hand daily pages, at intervals of 6 hours. It is to be applied to mean time in order to obtain apparent time.

8. *Meridian transit of Moon and planets.* The GMT of transit of the Moon and planets over the meridian of Greenwich is given for every day on the right-hand daily pages. The LMT of transit over another meridian may be obtained as described for moonrise in section 6.

9. *Accuracy.* Although the quantities in this volume are given to tenths of minutes, in general the GHA and Dec. of an object cannot actually be obtained accurate to 0′.1. The chief reason for loss of accuracy is the error of rounding off; any quantity given to 0′.1 is necessarily subject to an error that may be as large as 0′.05. When several such quantities are added together the errors of rounding may accumulate.

In general, the largest error that can occur in a GHA or Dec. taken from this volume is about 0′.2. In practice it may be expected that two-thirds of the quantities taken out will have errors less than 0′.1, and one-third will have errors between 0′.1 and 0′.2.

In the case of the Sun's GHA the error will on occasions be 0′.1 greater than the figures just given, owing to neglecting the code. This last error has been minimized by adjusting the printed GHA in such a way as to spread the error through the hour.

10. *Using the 1956 Almanac in 1957.* This volume may be used in 1957 for the Sun and stars, with errors generally less than 0′.4, in the following way.

Calculate the GHA of a star for the same date and time and add 44′.0 in January and February, subtract 15′.1 in March through December. Take out the Dec. of a star for the same date.

For the Sun's GHA use the same date and time and apply the correction from the table on page 253.

Take out the Sun's Dec. for a time $18^h\ 11^m$ later than the time of observation for a date in January and February, but for a date in March through December take a time $5^h\ 49^m$ earlier than the time of observation.

11. *Right ascension.* The right ascensions of objects are not needed in navigation. They may, however, be obtained if desired from the data in this volume.

The right ascension of a star is obtained by subtracting the SHA from 360°, and converting from arc to time by the table on page 260.

Example: Find the right ascension of star 12, Capella on 1956 January 3.

		° ′
		360 00.0
(From daily page for Jan. 1, 2, 3) SHA		281 37.6
Difference		78 22.4
78°	$5^h\ 12^m\ 00^s.0$	
22′	1 28 .0	
0′.4 or 24″	1 .6	
Right ascension	$5^h\ 13^m\ 29^s.6$	

The right ascension of the Sun, Moon, or a planet may be obtained by subtracting the GHA of the object from GHA ♈, and converting from arc to time.

Example: Find the right ascension of the Moon on 1956, January 3, $14^h\ 14^m\ 27^s$ GMT.

	♈	Moon	Code
	° ′	° ′	
(From the daily page for Jan. 1, 2, 3) Jan. 3, 14^h	312 10.8	138 11.3	+125
(From the yellow table 14^m, 27^s) $14^m\ 27^s$	3 37.3	3 26.9	
(From yellow table 14^m, code 125) code correction		+3.0	
GHA	315 48.1	141 41.2	
Difference	° ′ 174 06.9		

174°	$11^h\ 36^m\ 00^s.0$
6′	24 .0
0′.9 or 54″	3 .6
Right ascension	$11^h\ 36^m\ 27^s.6$

SUN'S GHA IN 1957

Apply to 1956 value to obtain 1957 value for same date and GMT.

	′		′		′		′		′		′
Jan.	−5.7	Jan.	−2.2	Feb.	+1.6	May	+0.1	Aug.	−0.4	Nov.	−0.1
3	−5.6	29	−2.1	23	+1.7	13	+0.2	16	−0.5	2	0.0
5	−5.5	30	−2.0	24	+1.8	14	+0.3	18	−0.6	4	+0.1
6	−5.4	31	−1.9	25	+1.9	16	+0.4	20	−0.7	5	+0.2
7	−5.3	Feb. 1	−1.7	26	+2.0	18	+0.5	22	−0.8	6	+0.3
8	−5.2	2	−1.6	28	. .	20	+0.6	23	−0.9	7	+0.4
9	−5.1	3	−1.5	. .	−0.8	June 6	+0.7	25	−1.0	8	+0.5
10	−4.9	4	−1.3	Mar. 2	−0.9	8	+0.8	27	−1.1	9	+0.6
11	−4.8	5	−1.2	4	−1.0	10	+0.9	28	−1.2	11	+0.7
12	−4.6	6	−1.0	15	−0.9	11	+1.0	Sept. 6	−1.1	12	+0.8
13	−4.5	7	−0.8	19	−0.8	14	+1.1	10	−1.0	15	+0.9
14	−4.3	8	−0.7	22	−0.9	22	+1.0	17	−1.1	24	+1.0
15	−4.1	9	−0.5	26	−1.0	24	+0.9	20	−1.2	27	+1.1
16	−3.9	10	−0.3	29	−1.1	26	+0.8	24	−1.3	29	+1.2
17	−3.8	11	−0.1	Apr. 9	−1.0	28	+0.7	Oct. 1	−1.2	30	+1.3
18	−3.6	12	+0.1	11	−0.9	July 16	+0.6	3	−1.1	Dec. 2	+1.4
19	−3.4	13	+0.3	12	−0.8	19	+0.5	5	−1.0	3	+1.5
20	−3.3	14	+0.5	14	−0.7	21	+0.4	7	−0.9	4	+1.6
21	−3.1	15	+0.6	15	−0.6	22	+0.3	8	−0.8	6	+1.7
22	−3.0	16	+0.8	18	−0.5	24	+0.2	10	−0.7	7	+1.8
23	−2.8	17	+1.0	21	−0.4	25	+0.1	12	−0.6	9	+1.9
24	−2.7	18	+1.1	May 6	−0.3	26	0.0	15	−0.5	11	+2.0
25	−2.6	19	+1.3	8	−0.2	28	−0.1	27	−0.4	17	+1.9
26	−2.5	20	+1.4	9	−0.1	29	−0.2	29	−0.3	19	+1.8
27	−2.3	21	+1.5	10	0.0	31	−0.3	31	−0.2	22	+1.7
28		22		11		Aug. 3		Nov. 1		32	

For a date given in the table, use the upper of the two possible values.

Mag.	Name and No.		SHA Jan.	SHA Feb.	SHA Mar.	SHA Apr.	SHA May	SHA June	Declination Jan.	Declination Feb.	Declination Mar.	Declination Apr.	Declination May	Declination June
			° ′	′	′	′	′	′	° ′	′	′	′	′	′
2.2	Alpheratz	1	358 28.2	28.3	28.3	28.2	28.0	27.8	+28 51.1	51.0	50.9	50.9	50.9	50.9
2.4	β Cassiopeiæ		358 17.6	17.8	17.9	17.7	17.5	17.1	+58 54.8	54.7	54.6	54.4	54.4	54.4
2.9	γ Pegasi		357 15.3	15.4	15.4	15.3	15.1	14.9	+14 56.5	56.5	56.4	56.4	56.4	56.5
2.9	β Hydri §		354 08.2	08.8	09.1	09.0	08.6	07.9	−77 30.3	30.2	30.1	29.8	29.6	29.5
2.4	Ankaa	2	353 58.2	58.3	58.3	58.3	58.1	57.9	−42 32.8	32.8	32.7	32.5	32.3	32.2
2.5	Schedar	3	350 29.8	30.0	30.1	30.0	29.8	29.5	+56 18.1	18.1	18.0	17.8	17.7	17.7
2.2	Diphda	4	349 39.1	39.2	39.2	39.2	39.0	38.8	−18 13.7	13.7	13.7	13.6	13.5	13.3
Var.*	γ Cassiopeiæ		346 29.1	29.4	29.5	29.5	29.2	28.9	+60 29.1	29.1	28.9	28.8	28.7	28.7
2.4	β Andromedæ		343 10.8	10.9	11.0	10.9	10.8	10.5	+35 23.5	23.5	23.4	23.3	23.3	23.3
2.8	δ Cassiopeiæ		339 15.8	16.0	16.2	16.2	16.0	15.6	+60 00.8	00.8	00.7	00.5	00.4	00.4
0.6	Achernar	5	335 58.6	58.9	59.1	59.1	59.0	58.8	−57 27.8	27.7	27.6	27.5	27.3	27.1
2.7	β Arietis		331 56.6	56.7	56.8	56.8	56.7	56.5	+20 35.8	35.8	35.7	35.7	35.7	35.7
2.1	Polaris		331 38.6	48.2	55.5	58.0	54.8	47.1	+89 03.9	03.9	03.8	03.7	03.5	03.4
3.0	α Hydri		330 39.0	39.3	39.6	39.7	39.6	39.4	−61 47.2	47.2	47.1	46.9	46.7	46.6
2.2	γ Andromedæ		329 41.7	41.8	42.0	42.0	41.9	41.7	+42 07.5	07.4	07.4	07.2	07.2	07.2
2.2	Hamal	6	328 49.3	49.4	49.5	49.5	49.4	49.2	+23 15.5	15.4	15.4	15.4	15.4	15.4
3.1	β Trianguli		328 15.8	15.9	16.0	16.1	16.0	15.7	+34 47.0	47.0	47.0	46.9	46.8	46.8
3.1	Acamar	7	315 50.8	50.9	51.1	51.2	51.2	51.1	−40 29.0	29.0	29.0	28.8	28.7	28.5
2.8	Menkar	8	314 59.9	60.0	60.1	60.2	60.1	60.0	+ 3 55.1	55.1	55.1	55.1	55.1	55.2
Var.†	β Persei		313 39.9	40.1	40.2	40.3	40.3	40.1	+40 47.5	47.5	47.4	47.3	47.3	47.2
1.9	Mirfak	9	309 41.8	41.9	42.1	42.2	42.2	42.0	+49 42.6	42.6	42.6	42.5	42.4	42.3
3.0	η Tauri		303 46.5	46.6	46.7	46.8	46.8	46.6	+23 58.3	58.3	58.3	58.3	58.2	58.2
2.9	ζ Persei		302 09.0	09.1	09.2	09.4	09.3	09.2	+31 45.4	45.4	45.4	45.3	45.3	45.3
3.0	ε Persei		301 15.9	16.0	16.2	16.3	16.3	16.2	+39 53.2	53.3	53.2	53.1	53.1	53.0
3.2	γ Eridani		300 59.9	60.0	60.1	60.3	60.3	60.2	−13 38.0	38.1	38.1	38.0	37.9	37.8
1.1	Aldebaran	10	291 38.5	38.6	38.7	38.8	38.9	38.8	+16 25.4	25.4	25.3	25.3	25.3	25.3
2.9	ι Aurigæ §		286 27.4	27.5	27.7	27.8	27.9	27.8	+33 06.0	06.0	06.0	05.9	05.9	05.9
2.9	β Eridani		283 34.2	34.2	34.4	34.5	34.6	34.5	− 5 08.6	08.6	08.7	08.6	08.6	08.5
0.3	Rigel	11	281 53.1	53.2	53.3	53.5	53.5	53.5	− 8 15.2	15.2	15.2	15.2	15.2	15.1
0.2	Capella	12	281 37.6	37.8	37.9	38.1	38.2	38.1	+45 57.4	57.5	57.5	57.4	57.3	57.3
1.7	Bellatrix	13	279 17.9	17.9	18.0	18.2	18.2	18.2	+ 6 18.6	18.6	18.6	18.6	18.6	18.6
1.8	Elnath	14	279 06.7	06.8	06.9	07.0	07.1	07.0	+28 34.3	34.4	34.4	34.3	34.3	34.3
3.0	β Leporis		278 24.1	24.1	24.3	24.5	24.5	24.5	−20 47.7	47.8	47.8	47.8	47.7	47.6
2.5	δ Orionis		277 33.1	33.1	33.2	33.4	33.4	33.4	− 0 19.9	19.9	20.0	19.9	19.9	19.8
2.7	α Leporis		277 17.6	17.7	17.8	18.0	18.1	18.0	−17 51.3	51.3	51.4	51.4	51.3	51.2
2.9	ι Orionis		276 40.2	40.3	40.4	40.6	40.6	40.6	− 5 56.3	56.4	56.4	56.4	56.3	56.3
1.8	Alnilam	15	276 29.7	29.8	29.9	30.0	30.1	30.1	− 1 13.8	13.8	13.9	13.9	13.8	13.8
3.0	ζ Tauri		276 14.1	14.2	14.3	14.5	14.5	14.5	+21 07.0	07.0	07.0	07.0	07.0	07.0
2.8	α Columbæ		275 28.6	28.7	28.9	29.1	29.2	29.2	−34 05.9	06.0	06.1	06.1	06.0	05.8
1.9	ζ Orionis		275 21.4	21.4	21.5	21.7	21.7	21.7	− 1 57.9	58.0	58.0	58.0	58.0	57.9
2.2	κ Orionis		273 34.4	34.4	34.6	34.7	34.8	34.8	− 9 41.1	41.2	41.2	41.2	41.2	41.1
Var.‡	Betelgeuse	16	271 47.5	47.6	47.7	47.9	47.9	47.9	+ 7 24.0	23.9	23.9	23.9	23.9	24.0
2.1	β Aurigæ		270 54.6	54.7	54.8	55.1	55.2	55.1	+44 56.7	56.8	56.8	56.8	56.7	56.7
2.7	θ Aurigæ		270 48.4	48.5	48.6	48.8	48.9	48.8	+37 12.7	12.7	12.7	12.7	12.7	12.6
2.0	β Canis Majoris		264 48.0	48.0	48.1	48.3	48.4	48.4	−17 56.1	56.2	56.2	56.2	56.2	56.1
−0.9	Canopus	17	264 14.7	14.9	15.1	15.4	15.6	15.7	−52 40.4	40.6	40.6	40.6	40.5	40.4
1.9	γ Geminorum		261 11.8	11.8	11.9	12.1	12.1	12.1	+16 26.2	26.2	26.2	26.2	26.2	26.2
−1.6	Sirius	18	259 11.3	11.3	11.4	11.6	11.7	11.7	−16 39.4	39.5	39.5	39.5	39.5	39.4
2.8	τ Puppis		257 46.7	46.8	47.0	47.3	47.5	47.6	−50 33.8	34.0	34.1	34.1	34.0	33.9
1.6	Adhara	19	255 46.0	46.0	46.1	46.3	46.4	46.5	−28 54.8	54.9	55.0	55.0	55.0	54.9
3.1	o Canis Majoris		254 41.6	41.6	41.7	41.9	42.0	42.1	−23 46.2	46.3	46.4	46.4	46.3	46.3
2.0	δ Canis Majoris		253 20.4	20.4	20.5	20.7	20.8	20.9	−26 19.5	19.6	19.7	19.7	19.6	19.5
2.7	π Puppis		251 05.5	05.6	05.7	05.9	06.1	06.2	−37 01.2	01.3	01.4	01.4	01.4	01.3
2.4	η Canis Majoris		249 24.1	24.1	24.2	24.4	24.5	24.6	−29 13.1	13.2	13.3	13.3	13.3	13.2
3.1	β Canis Minoris		248 47.9	47.9	47.9	48.1	48.2	48.2	+ 8 22.6	22.6	22.6	22.6	22.6	22.6
3.3	σ Puppis		248 01.8	01.9	02.0	02.3	02.4	02.5	−43 12.8	13.0	13.1	13.1	13.1	12.9
1.6	α Geminorum		247 02.3	02.3	02.4	02.6	02.7	02.7	+31 59.1	59.1	59.1	59.2	59.2	59.1

*Irregular variable; 1950 Mag. 2.5 †2.3–3.5. ‡0.1–1.2. §Not suitable for use with H. O. 214.

Mag.	Name and No.		SHA							Declination						
				July	Aug.	Sept.	Oct.	Nov.	Dec.		July	Aug.	Sept.	Oct.	Nov.	Dec.
			°	′	′	′	′	′	′	°	′	′	′	′	′	′
2.2	Alpheratz	1	358	27.5	27.3	27.2	27.2	27.2	27.3	+28	51.0	51.2	51.3	51.4	51.4	51.4
2.4	β Cassiopeiæ		358	16.7	16.4	16.2	16.2	16.3	16.5	+58	54.5	54.6	54.8	55.0	55.1	55.1
2.9	γ Pegasi		357	14.7	14.5	14.4	14.4	14.4	14.5	+14	56.6	56.7	56.8	56.9	56.9	56.9
2.9	β Hydri §		354	07.1	06.4	06.0	06.0	06.4	07.1	−77	29.5	29.6	29.7	29.8	30.0	30.0
2.4	Ankaa	2	353	57.6	57.3	57.2	57.1	57.2	57.4	−42	32.1	32.1	32.2	32.3	32.4	32.5
2.5	Schedar	3	350	29.1	28.8	28.6	28.5	28.5	28.7	+56	17.8	17.9	18.1	18.3	18.4	18.5
2.2	Diphda	4	349	38.6	38.4	38.2	38.2	38.2	38.3	−18	13.2	13.2	13.2	13.2	13.3	13.4
Var.*	γ Cassiopeiæ		346	28.5	28.1	27.9	27.8	27.8	28.0	+60	28.7	28.9	29.0	29.2	29.3	29.4
2.4	β Andromedæ		343	10.3	10.0	09.8	09.8	09.8	09.8	+35	23.4	23.5	23.6	23.7	23.8	23.8
2.8	δ Cassiopeiæ		339	15.2	14.9	14.6	14.4	14.4	14.6	+60	00.4	00.5	00.7	00.8	01.0	01.1
0.6	Achernar	5	335	58.5	58.1	57.8	57.7	57.8	57.9	−57	27.0	27.0	27.1	27.2	27.4	27.5
2.7	β Arietis		331	56.2	56.0	55.8	55.7	55.7	55.7	+20	35.8	35.9	36.0	36.0	36.1	36.1
2.1	Polaris		331	37.0	26.4	18.0	13.0	12.7	17.4	+89	03.4	03.5	03.6	03.8	03.9	04.1
3.0	α Hydri		330	39.0	38.6	38.3	38.2	38.2	38.4	−61	46.5	46.4	46.5	46.6	46.8	46.9
2.2	γ Andromedæ		329	41.4	41.1	40.9	40.7	40.7	40.7	+42	07.2	07.3	07.4	07.5	07.6	07.7
2.2	Hamal	6	328	49.0	48.8	48.5	48.4	48.4	48.4	+23	15.4	15.5	15.6	15.7	15.7	15.7
3.1	β Trianguli		328	15.5	15.2	15.0	14.9	14.8	14.8	+34	46.9	47.0	47.1	47.2	47.2	47.3
3.1	Acamar	7	315	50.8	50.6	50.3	50.2	50.1	50.1	−40	28.4	28.3	28.3	28.4	28.6	28.7
2.8	Menkar	8	314	59.8	59.6	59.4	59.2	59.1	59.1	+ 3	55.3	55.4	55.4	55.4	55.4	55.4
Var.†	β Persei		313	39.8	39.5	39.3	39.1	39.0	38.9	+40	47.3	47.3	47.4	47.5	47.6	47.6
1.9	Mirfak	9	309	41.7	41.4	41.1	40.8	40.7	40.6	+49	42.3	42.4	42.4	42.5	42.6	42.7
3.0	η Tauri		303	46.4	46.2	46.0	45.8	45.6	45.6	+23	58.3	58.3	58.4	58.4	58.5	58.5
2.9	ζ Persei		302	09.0	08.7	08.5	08.3	08.1	08.0	+31	45.3	45.3	45.4	45.4	45.5	45.5
3.0	ε Persei		301	15.9	15.7	15.4	15.1	15.0	14.9	+39	53.0	53.1	53.1	53.2	53.3	53.3
3.2	γ Eridani		300	60.0	59.8	59.5	59.4	59.2	59.2	−13	37.7	37.7	37.6	37.7	37.7	37.8
1.1	Aldebaran	10	291	38.6	38.4	38.1	37.9	37.8	37.7	+16	25.4	25.4	25.5	25.5	25.5	25.5
2.9	ι Aurigæ §		286	27.6	27.3	27.1	26.8	26.6	26.5	+33	05.8	05.9	05.9	05.9	05.9	06.0
2.9	β Eridani		283	34.4	34.2	33.9	33.7	33.6	33.5	− 5	08.4	08.4	08.3	08.3	08.4	08.5
0.3	Rigel	11	281	53.3	53.1	52.9	52.7	52.5	52.4	− 8	15.0	14.9	14.9	14.9	15.0	15.1
0.2	Capella	12	281	37.9	37.6	37.3	37.0	36.8	36.6	+45	57.2	57.2	57.2	57.2	57.3	57.4
1.7	Bellatrix	13	279	18.1	17.9	17.6	17.4	17.2	17.1	+ 6	18.7	18.7	18.8	18.8	18.7	18.7
1.8	Elnath	14	279	06.9	06.7	06.4	06.2	06.0	05.8	+28	34.3	34.3	34.3	34.3	34.3	34.3
3.0	β Leporis		278	24.4	24.2	24.0	23.7	23.6	23.5	−20	47.5	47.4	47.4	47.4	47.5	47.6
2.5	δ Orionis		277	33.3	33.1	32.9	32.7	32.5	32.4	− 0	19.8	19.7	19.7	19.7	19.8	19.8
2.7	α Leporis		277	17.9	17.7	17.5	17.3	17.1	17.0	−17	51.1	51.0	50.9	51.0	51.1	51.2
2.9	ι Orionis		276	40.5	40.3	40.1	39.9	39.7	39.6	− 5	56.2	56.1	56.1	56.1	56.2	56.3
1.8	Alnilam	15	276	29.9	29.8	29.5	29.3	29.1	29.0	− 1	13.7	13.6	13.6	13.6	13.7	13.7
3.0	ζ Tauri		276	14.3	14.1	13.9	13.7	13.5	13.3	+21	07.0	07.0	07.0	07.0	07.0	07.0
2.8	α Columbæ		275	29.1	28.9	28.6	28.4	28.2	28.1	−34	05.7	05.6	05.5	05.6	05.7	05.8
1.9	ζ Orionis		275	21.6	21.4	21.2	21.0	20.8	20.7	− 1	57.8	57.8	57.7	57.8	57.8	57.9
2.2	κ Orionis		273	34.7	34.5	34.3	34.1	33.9	33.7	− 9	41.0	40.9	40.9	40.9	41.0	41.1
Var.‡	Betelgeuse	16	271	47.8	47.6	47.4	47.2	47.0	46.8	+ 7	24.0	24.1	24.1	24.1	24.0	24.0
2.1	β Aurigæ		270	55.0	54.7	54.4	54.1	53.9	53.7	+44	56.6	56.5	56.5	56.5	56.6	56.6
2.7	θ Aurigæ		270	48.7	48.5	48.2	47.9	47.7	47.5	+37	12.6	12.6	12.6	12.6	12.6	12.6
2.0	β Canis Majoris		264	48.3	48.2	48.0	47.8	47.6	47.4	−17	56.0	55.9	55.8	55.9	55.9	56.1
−0.9	Canopus	17	264	15.6	15.5	15.2	14.9	14.6	14.4	−52	40.2	40.1	40.0	40.0	40.1	40.3
1.9	γ Geminorum		261	12.0	11.9	11.7	11.4	11.2	11.0	+16	26.2	26.2	26.2	26.2	26.2	26.2
−1.6	Sirius	18	259	11.7	11.5	11.3	11.1	10.9	10.7	−16	39.3	39.2	39.2	39.2	39.3	39.4
2.8	τ Puppis		257	47.5	47.4	47.1	46.8	46.6	46.4	−50	33.7	33.6	33.5	33.5	33.6	33.8
1.6	Adhara	19	255	46.4	46.3	46.1	45.9	45.6	45.5	−28	54.7	54.6	54.5	54.6	54.6	54.8
3.1	ο Canis Majoris		254	42.0	41.9	41.7	41.5	41.2	41.1	−23	46.1	46.0	46.0	46.0	46.1	46.2
2.0	δ Canis Majoris		253	20.8	20.7	20.5	20.3	20.0	19.9	−26	19.4	19.3	19.2	19.2	19.3	19.5
2.7	π Puppis		251	06.1	06.0	05.8	05.6	05.3	05.1	−37	01.1	01.0	00.9	00.9	01.0	01.2
2.4	η Canis Majoris		249	24.5	24.4	24.2	24.0	23.8	23.6	−29	13.1	13.0	12.9	12.9	13.0	13.1
3.1	β Canis Minoris		248	48.2	48.0	47.9	47.6	47.4	47.2	+ 8	22.7	22.7	22.7	22.7	22.6	22.5
3.3	σ Puppis		248	02.5	02.4	02.2	01.9	01.7	01.5	−43	12.8	12.7	12.6	12.6	12.6	12.8
1.6	α Geminorum		247	02.7	02.5	02.3	02.1	01.8	01.6	+31	59.1	59.0	59.0	59.0	58.9	58.9

*Irregular variable; 1950 Mag. 2.5. †2.3–3.5. ‡0.1–1.2. §Not suitable for use with H. O. 214.

Mag.	Name and No.		SHA	Jan.	Feb.	Mar.	Apr.	May	June	Declination	Jan.	Feb.	Mar.	Apr.	May	June
			°	′	′	′	′	′	′	°	′	′	′	′	′	′
0.5	Procyon	20	245	44.4	44.4	44.5	44.6	44.7	44.7	+ 5	20.2	20.1	20.1	20.1	20.1	20.2
1.2	Pollux	21	244	19.9	19.9	19.9	20.1	20.2	20.3	+28	07.9	07.9	07.9	08.0	08.0	07.9
2.3	ζ Puppis		239	28.8	28.8	28.9	29.1	29.3	29.4	−39	52.8	52.9	53.1	53.1	53.1	53.0
2.9	ρ Puppis		238	34.3	34.3	34.4	34.6	34.7	34.8	−24	10.7	10.8	10.9	11.0	10.9	10.9
1.9	γ Velorum		237	56.7	56.7	56.8	57.1	57.3	57.4	−47	12.4	12.6	12.8	12.8	12.8	12.7
1.7	Avior	22	234	35.0	35.0	35.2	35.5	35.8	36.0	−59	22.1	22.3	22.4	22.5	22.5	22.4
2.0	δ Velorum		229	06.9	06.9	07.0	07.3	07.5	07.7	−54	32.8	33.0	33.2	33.3	33.3	33.2
3.1	ι Ursæ Majoris		225	56.1	56.0	56.0	56.2	56.4	56.5	+48	12.7	12.8	12.8	12.9	12.9	12.9
2.2	Suhail	23	223	23.7	23.6	23.7	23.9	24.1	24.2	−43	15.3	15.5	15.6	15.7	15.7	15.7
1.8	Miaplacidus	24	221	48.1	48.0	48.2	48.6	49.0	49.4	−69	32.1	32.4	32.5	32.6	32.7	32.6
2.2	ι Carinæ		221	00.5	00.4	00.5	00.8	01.1	01.3	−59	05.4	05.6	05.8	05.9	05.9	05.9
2.6	κ Velorum		219	48.0	47.9	48.0	48.2	48.5	48.7	−54	49.3	49.5	49.7	49.8	49.8	49.8
2.2	Alphard	25	218	38.0	37.9	38.0	38.1	38.2	38.2	− 8	28.2	28.3	28.3	28.4	28.4	28.3
3.0	*N* Velorum		217	31.0	30.9	31.0	31.2	31.5	31.7	−56	50.4	50.6	50.7	50.9	50.9	50.9
3.1	ϵ Leonis		214	09.0	08.9	08.9	09.0	09.1	09.2	+23	58.4	58.4	58.4	58.5	58.5	58.5
1.3	Regulus	26	208	29.0	28.8	28.8	28.9	29.0	29.1	+12	10.7	10.7	10.7	10.7	10.8	10.8
2.3	γ Leonis		205	36.2	36.1	36.0	36.1	36.2	36.3	+20	03.6	03.6	03.6	03.7	03.7	03.7
3.0	θ Carinæ §		199	38.5	38.3	38.2	38.4	38.7	39.0	−64	09.7	09.9	10.1	10.3	10.4	10.4
2.8	μ Velorum		198	46.3	46.1	46.1	46.2	46.3	46.5	−49	11.2	11.4	11.5	11.7	11.8	11.7
2.4	β Ursæ Majoris		195	11.4	11.1	11.0	11.1	11.3	11.5	+56	36.7	36.8	36.9	37.0	37.1	37.1
2.0	Dubhe	27	194	43.9	43.6	43.5	43.6	43.9	44.1	+61	58.9	59.0	59.1	59.3	59.3	59.4
3.2	ψ Ursæ Majoris		193	11.5	11.3	11.2	11.3	11.4	11.5	+44	43.9	43.9	44.0	44.1	44.2	44.2
2.6	δ Leonis		192	03.0	02.8	02.7	02.7	02.8	02.9	+20	45.6	45.6	45.6	45.7	45.7	45.7
2.2	Denebola	28	183	17.3	17.1	17.0	17.0	17.1	17.2	+14	48.8	48.8	48.8	48.8	48.9	48.9
2.5	γ Ursæ Majoris		182	06.7	06.4	06.2	06.3	06.4	06.6	+53	56.0	56.0	56.1	56.2	56.3	56.4
2.9	δ Centauri		178	28.5	28.2	28.0	28.0	28.1	28.2	−50	28.5	28.7	28.9	29.0	29.1	29.2
2.8	Gienah	29	176	36.5	36.3	36.2	36.1	36.2	36.2	−17	17.9	18.1	18.2	18.2	18.2	18.2
1.1	Acrux	30	173	57.3	56.9	56.7	56.7	56.8	57.0	−62	51.2	51.4	51.5	51.7	51.8	51.9
1.6	Gacrux	31	172	48.8	48.4	48.3	48.2	48.3	48.5	−56	51.9	52.1	52.2	52.4	52.5	52.6
2.8	β Corvi		171	58.6	58.3	58.2	58.1	58.2	58.2	−23	09.2	09.4	09.5	09.6	09.6	09.6
2.9	α Muscæ		171	21.3	20.9	20.5	20.5	20.6	20.9	−68	53.4	53.5	53.7	53.9	54.1	54.2
2.4	γ Centauri		170	13.4	13.1	12.9	12.8	12.9	13.0	−48	43.0	43.1	43.3	43.5	43.6	43.6
2.9	γ Virginis		170	08.2	08.0	07.9	07.8	07.8	07.9	− 1	12.7	12.7	12.8	12.8	12.8	12.8
1.5	β Crucis		168	42.5	42.1	41.9	41.8	41.9	42.0	−59	26.8	26.9	27.0	27.3	27.4	27.4
1.7	Alioth	32	166	58.2	57.9	57.7	57.6	57.7	57.9	+56	11.5	11.5	11.6	11.7	11.9	11.9
2.9	α Canum Venat.		166	30.2	29.9	29.7	29.6	29.7	29.8	+38	33.0	32.9	33.0	33.1	33.2	33.3
3.0	ϵ Virginis		164	59.9	59.7	59.5	59.5	59.5	59.5	+11	11.5	11.4	11.4	11.4	11.5	11.5
2.9	ι Centauri		160	27.9	27.7	27.5	27.3	27.3	27.4	−36	28.8	28.9	29.0	29.2	29.2	29.3
2.2	ζ Ursæ Majoris		159	27.5	27.2	26.9	26.8	26.9	27.0	+55	08.9	08.9	08.9	09.1	09.2	09.3
1.2	Spica	33	159	16.6	16.4	16.2	16.1	16.1	16.2	−10	56.0	56.1	56.2	56.2	56.2	56.2
2.6	ϵ Centauri		155	43.4	43.0	42.7	42.5	42.5	42.6	−53	14.5	14.5	14.7	14.9	15.0	15.1
1.9	Alkaid	34	153	32.7	32.4	32.2	32.1	32.1	32.2	+49	31.6	31.5	31.6	31.7	31.9	32.0
2.8	η Bootis		151	51.0	50.7	50.5	50.4	50.4	50.5	+18	36.8	36.7	36.7	36.8	36.9	36.9
3.1	ζ Centauri		151	47.9	47.6	47.4	47.2	47.1	47.2	−47	04.2	04.3	04.4	04.6	04.7	04.8
0.9	Hadar	35	149	49.1	48.7	48.4	48.2	48.1	48.2	−60	09.5	09.6	09.7	09.9	10.0	10.1
2.3	Menkent	36	148	58.4	58.1	57.9	57.8	57.7	57.8	−36	09 2	09.3	09.4	09.5	09.6	09.6
0.2	Arcturus	37	146	35.0	34.8	34.6	34.5	34.4	34.5	+19	24.4	24.3	24.3	24.4	24.5	24.5
3.0	γ Bootis		142	25.4	25.1	24.8	24.7	24.6	24.7	+38	29.7	29.6	29.6	29.8	29.9	30.0
2.6	η Centauri		141	49.2	48.9	48.6	48.4	48.3	48.4	−41	57.8	57.9	58.0	58.1	58.2	58.3
0.1	Rigil Kent.	38	140	50.8	50.3	50.0	49.7	49.7	49.7	−60	39.2	39.2	39.3	39.5	39.6	39.7
2.9	α Lupi		140	14.9	14.6	14.3	14.0	13.9	14.0	−47	11.9	12.0	12.1	12.2	12.3	12.4
2.6	ϵ Bootis		139	13.9	13.7	13.5	13.3	13.3	13.3	+27	15.3	15.2	15.2	15.3	15.4	15.5
2.9	Zubenelgenubi	39	137	53.2	52.9	52.7	52.6	52.5	52.5	−15	51.6	51.7	51.8	51.8	51.8	51.8
2.2	Kochab	40	137	18.4	17.7	17.2	16.8	16.8	17.1	+74	19.7	19.7	19.7	19.9	20.1	20.2
2.8	β Lupi		136	05.2	04.9	04.6	04.4	04.3	04.3	−42	57.4	57.4	57.5	57.6	57.7	57.8
2.7	β Libræ		131	20.3	20.1	19.9	19.7	19.6	19.6	− 9	13.4	13.4	13.5	13.5	13.5	13.5
3.1	γ Trianguli Aust.		131	18.3	17.7	17.2	16.7	16.5	16.5	−68	30.9	30.9	31.0	31.2	31.3	31.5

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Mag.	Name and No.		SHA							Declination						
				July	Aug.	Sept.	Oct.	Nov.	Dec.		July	Aug.	Sept.	Oct.	Nov.	Dec.
			°	′	′	′	′	′	′	°	′	′	′	′	′	′
0.5	Procyon	20	245	44.7	44.6	44.4	44.2	44.0	43.8	+ 5	20.2	20.2	20.3	20.2	20.2	20.1
1.2	Pollux	21	244	20.2	20.1	19.9	19.7	19.4	19.2	+28	07.9	07.9	07.8	07.8	07.7	07.7
2.3	ζ Puppis		239	29.4	29.3	29.1	28.9	28.6	28.4	−39	52.9	52.7	52.7	52.6	52.7	52.8
2.9	ρ Puppis		238	34.7	34.7	34.5	34.3	34.1	33.9	−24	10.8	10.6	10.6	10.6	10.6	10.8
1.9	γ Velorum		237	57.4	57.3	57.1	56.9	56.6	56.3	−47	12.6	12.4	12.3	12.3	12.4	12.5
1.7	Avior	22	234	36.1	36.1	35.9	35.5	35.2	34.8	−59	22.3	22.2	22.0	22.0	22.0	22.1
2.0	δ Velorum		229	07.8	07.8	07.6	07.3	07.0	06.7	−54	33.1	32.9	32.8	32.8	32.8	32.9
3.1	ι Ursæ Majoris		225	56.6	56.5	56.3	56.0	55.7	55.4	+48	12.8	12.7	12.6	12.5	12.4	12.4
2.2	Suhail	23	223	24.3	24.2	24.1	23.9	23.6	23.3	−43	15.6	15.4	15.3	15.3	15.3	15.4
1.8	Miaplacidus	24	221	49.7	49.7	49.5	49.1	48.6	48.1	−69	32.5	32.4	32.2	32.1	32.1	32.2
2.2	ι Carinæ		221	01.5	01.5	01.3	01.1	00.7	00.3	−59	05.8	05.6	05.5	05.4	05.4	05.5
2.6	κ Velorum		219	48.8	48.8	48.7	48.4	48.1	47.8	−54	49.7	49.5	49.4	49.3	49.4	49.5
2.2	Alphard	25	218	38.3	38.3	38.1	38.0	37.8	37.5	− 8	28.3	28.2	28.2	28.2	28.2	28.3
3.0	N Velorum		217	31.8	31.8	31.7	31.4	31.1	30.7	−56	50.8	50.6	50.5	50.4	50.4	50.5
3.1	ϵ Leonis		214	09.2	09.2	09.1	08.9	08.7	08.4	+23	58.5	58.5	58.4	58.3	58.2	58.2
1.3	Regulus	26	208	29.1	29.1	29.0	28.9	28.7	28.4	+12	10.8	10.8	10.8	10.7	10.6	10.5
2.3	γ Leonis		205	36.3	36.3	36.3	36.1	35.9	35.6	+20	03.7	03.7	03.6	03.6	03.5	03.4
3.0	θ Carinæ §		199	39.2	39.3	39.3	39.1	38.7	38.2	−64	10.3	10.2	10.0	09.9	09.9	09.9
2.8	μ Velorum		198	46.6	46.7	46.7	46.5	46.2	45.9	−49	11.7	11.6	11.4	11.3	11.3	11.4
2.4	β Ursæ Majoris		195	11.7	11.8	11.7	11.6	11.3	10.9	+56	37.1	37.0	36.8	36.7	36.5	36.4
2.0	Dubhe	27	194	44.3	44.4	44.4	44.2	43.9	43.5	+61	59.3	59.2	59.0	58.9	58.7	58.6
3.2	ψ Ursæ Majoris		193	11.7	11.7	11.7	11.6	11.3	11.0	+44	44.2	44.1	44.0	43.8	43.7	43.6
2.6	δ Leonis		192	03.0	03.0	03.0	02.9	02.7	02.5	+20	45.8	45 7	45.7	45.6	45.5	45.4
2.2	Denebola	28	183	17.3	17.3	17.3	17.2	17.1	16.8	+14	48.9	48.9	48.9	48.8	48.7	48.6
2.5	γ Ursæ Majoris		182	06.8	06.9	06.9	06.9	06.6	06.3	+53	56.3	56.3	56.1	56.0	55.8	55.7
2.9	δ Centauri		178	28.4	28.5	28.6	28.5	28.3	28.0	−50	29.1	29.0	28.9	28.8	28.8	28.8
2.8	Gienah	29	176	36.3	36.4	36.4	36.4	36.2	36.0	−17	18.2	18.1	18.1	18.1	18.1	18.2
1.1	Acrux	30	173	57.2	57.5	57.6	57.5	57.3	56.9	−62	51.9	51.8	51.7	51.5	51.4	51.4
1.6	Gacrux	31	172	48.6	48.8	48.9	48.9	48.7	48.3	−56	52.5	52.5	52.3	52.2	52.1	52.1
2.8	β Corvi		171	58.3	58.4	58.4	58.4	58.2	58.0	−23	09.6	09.5	09.5	09.4	09.4	09.5
2.9	α Muscæ		171	21.2	21.5	21.7	21.7	21.3	20.8	−68	54.2	54.1	54.0	53.8	53.7	53.7
2.4	γ Centauri		170	13.1	13.3	13.4	13.3	13.1	12.8	−48	43.6	43.5	43.4	43.3	43.2	43.2
2.9	γ Virginis		170	08.0	08.1	08.1	08.1	07.9	07.7	− 1	12.7	12.7	12.7	12.7	12.8	12.9
1.5	β Crucis		168	42.2	42.4	42.6	42.5	42.3	41.9	−59	27.4	27.4	27.2	27.1	27.0	27.0
1.7	Alioth	32	166	58.1	58.3	58.5	58.5	58.3	58.0	+56	11.9	11.9	11.7	11.6	11.4	11.3
2.9	α Canum Venat.		166	29.9	30.1	30.1	30.1	30.0	29.8	+38	33.3	33.3	33.2	33.1	32.9	32.8
3.0	ϵ Virginis		164	59.6	59.7	59.8	59.7	59.6	59.4	+11	11.6	11.6	11.6	11.5	11.4	11.3
2.9	ι Centauri		160	27.5	27.6	27.7	27.7	27.6	27.3	−36	29.3	29.2	29.1	29.0	29.0	29.0
2.2	ζ Ursæ Majoris		159	27.2	27.5	27.6	27.6	27.5	27.3	+55	09.3	09.3	09.2	09.0	08.8	08.7
1.2	Spica	33	159	16.2	16.3	16.4	16.4	16.3	16.1	−10	56.2	56.2	56.1	56.1	56.1	56.2
2.6	ϵ Centauri		155	42.8	43.0	43.1	43.1	43.0	42.7	−53	15.1	15.0	14.9	14.8	14.7	14.7
1.9	Alkaid	34	153	32.4	32.6	32.7	32.8	32.7	32.5	+49	32.0	32.0	31.9	31.7	31.6	31.4
2.8	η Bootis		151	50.5	50.6	50.7	50.8	50.7	50.5	+18	37.0	37.0	37.0	36.9	36.8	36.6
3.1	ζ Centauri		151	47.3	47.5	47.6	47.7	47.5	47.3	−47	04.8	04.7	04.7	04.6	04.5	04.5
0.9	Hadar	35	149	48.4	48.6	48.8	48.9	48.8	48.5	−60	10.2	10.2	10.1	09.9	09.8	09.8
2.3	Menkent	36	148	57.9	58.0	58.1	58.1	58.0	57.8	−36	09.6	09.6	09.5	09.5	09.4	09.4
0.2	Arcturus	37	146	34.6	34.7	34.8	34.8	34.8	34.6	+19	24.6	24.6	24.6	24.5	24.4	24.2
3.0	γ Bootis		142	24.8	25.0	25.1	25.2	25.2	25.0	+38	30.1	30.1	30.0	29.9	29.7	29.6
2.6	η Centauri		141	48.5	48.6	48.7	48.8	48.7	48.5	−41	58.3	58.3	58.2	58.1	58.1	58.0
0.1	Rigil Kent.	38	140	49.9	50.1	50.4	50.5	50.4	50.1	−60	39.8	39.7	39.7	39.5	39.4	39.4
2.9	α Lupi		140	14.1	14.2	14.4	14.5	14.4	14.2	−47	12.4	12.4	12.3	12.2	12.2	12.1
2.6	ϵ Bootis		139	13.4	13.5	13.6	13.7	13.7	13.5	+27	15.6	15.6	15.5	15.5	15.3	15.2
2.9	Zubenelgenubi	39	137	52.6	52.7	52.8	52.8	52.8	52.6	−15	51.8	51.8	51.8	51.7	51.7	51.8
2.2	Kochab	40	137	17.6	18.2	18.8	19.2	19.3	19.1	+74	20.3	20.3	20.2	20.0	19.9	19.7
2.8	β Lupi		136	04.3	04.5	04.6	04.7	04.7	04.5	−42	57.8	57.8	57.8	57.7	57.6	57.6
2.7	β Libræ		131	19.6	19.7	19.8	19.9	19.9	19.7	− 9	13.4	13.4	13.4	13.4	13.4	13.5
3.1	γ Trianguli Aust.		131	16.7	17.0	17.4	17.6	17.6	17.3	−68	31.5	31.6	31.5	31.4	31.3	31.2

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Mag.	Name and No.		SHA	Jan.	Feb.	Mar.	Apr.	May	June	Declination	Jan.	Feb.	Mar.	Apr.	May	June
			°	′	′	′	′	′	′	°	′	′	′	′	′	′
3.1	γ Ursæ Minoris §		129	49.0	48.4	47.9	47.4	47.4	47.6	+71	59.1	59.0	59.1	59.2	59.4	59.5
3.0	γ Lupi §		126	56.9	56.6	56.3	56.0	55.9	55.8	−41	01.1	01.2	01.2	01.3	01.4	01.5
2.3	Alphecca	41	126	47.6	47.3	47.1	47.0	46.9	46.9	+26	51.5	51.4	51.4	51.5	51.6	51.7
2.8	α Serpentis		124	28.5	28.2	28.0	27.8	27.7	27.7	+ 6	33.7	33.6	33.5	33.6	33.6	33.7
3.0	β Trianguli Aust.		122	11.3	10.8	10.3	09.8	09.6	09.6	−63	17.6	17.6	17.7	17.8	17.9	18.1
2.5	δ Scorpii		120	34.0	33.7	33.5	33.2	33.1	33.1	−22	29.9	29.9	30.0	30.0	30.0	30.0
2.8	β Scorpii		119	16.8	16.5	16.3	16.1	15.9	15.9	−19	41.2	41.2	41.3	41.3	41.3	41.3
3.0	δ Ophiuchi		116	59.4	59.2	58.9	58.7	58.6	58.5	− 3	35.0	35.1	35.1	35.1	35.1	35.0
2.9	η Draconis		114	09.6	09.3	08.9	08.5	08.4	08.4	+61	36.6	36.5	36.4	36.6	36.7	36.9
1.2	Antares	42	113	19.3	19.0	18.8	18.6	18.4	18.3	−26	20.1	20.2	20.2	20.2	20.2	20.3
2.8	β Herculis		112	55.1	54.9	54.7	54.4	54.3	54.3	+21	34.9	34.8	34.8	34.8	34.9	35.1
2.9	τ Scorpii		111	42.9	42.6	42.3	42.1	41.9	41.8	−28	07.5	07.6	07.6	07.6	07.7	07.7
2.7	ζ Ophiuchi		111	19.0	18.7	18.5	18.2	18.1	18.0	−10	28.8	28.8	28.9	28.9	28.9	28.8
3.0	ζ Herculis		110	05.7	05.5	05.3	05.0	04.9	04.8	+31	40.7	40.6	40.6	40.7	40.8	40.9
1.9	Atria	43	108	60.2	59.6	59.1	58.5	58.2	58.0	−68	56.8	56.8	56.8	56.9	57.0	57.1
2.4	ϵ Scorpii		108	10.3	10.1	09.8	09.5	09.3	09.2	−34	12.8	12.8	12.9	12.9	12.9	13.0
3.1	ζ Aræ		106	15.5	15.1	14.7	14.2	14.0	13.9	−55	55.2	55.2	55.2	55.3	55.4	55.5
2.6	Sabik	44	103	02.2	01.9	01.7	01.5	01.3	01.2	−15	40.3	40.4	40.4	40.4	40.4	40.3
Var.*	α Herculis		101	50.5	50.3	50.0	49.8	49.6	49.5	+14	26.3	26.2	26.1	26.2	26.3	26.4
2.8	β Aræ		99	35.5	35.2	34.8	34.3	34.0	33.9	−55	29.3	29.3	29.3	29.3	29.4	29.5
2.8	ν Scorpii		98	03.5	03.2	02.9	02.6	02.4	02.2	−37	15.7	15.7	15.7	15.7	15.7	15.8
3.0	α Aræ		97	53.5	53.2	52.9	52.4	52.2	52.0	−49	50.5	50.5	50.4	50.5	50.5	50.6
3.0	β Draconis		97	38.8	38.6	38.3	37.9	37.7	37.7	+52	19.9	19.7	19.7	19.7	19.9	20.1
1.7	Shaula	45	97	20.7	20.4	20.2	19.9	19.7	19.5	−37	04.3	04.3	04.3	04.3	04.4	04.4
2.1	Rasalhague	46	96	46.7	46.5	46.3	46.0	45.9	45.8	+12	35.4	35.3	35.3	35.3	35.4	35.5
2.0	θ Scorpii		96	27.7	27.4	27.1	26.8	26.5	26.4	−42	58.2	58.2	58.2	58.2	58.2	58.3
2.5	κ Scorpii		95	08.4	08.2	07.9	07.5	07.3	07.1	−39	00.5	00.5	00.5	00.5	00.5	00.5
2.9	β Ophiuchi		94	40.6	40.4	40.2	39.9	39.7	39.6	+ 4	35.0	35.0	34.9	34.9	35.0	35.1
2.4	Eltanin	47	91	06.6	06.4	06.1	05.8	05.6	05.4	+51	29.5	29.4	29.3	29.4	29.5	29.6
3.1	γ Sagittarii		89	15.3	15.1	14.9	14.5	14.3	14.2	−30	25.5	25.5	25.5	25.5	25.5	25.5
2.8	δ Sagittarii		85	27.4	27.2	26.9	26.6	26.4	26.2	−29	50.9	50.9	50.8	50.8	50.8	50.8
2.0	Kaus Australis	48	84	41.2	41.0	40.8	40.5	40.2	40.1	−34	24.4	24.3	24.3	24.3	24.3	24.3
2.9	λ Sagittarii		83	41.2	41.0	40.8	40.5	40.3	40.1	−25	26.8	26.8	26.8	26.8	26.8	26.8
0.1	Vega	49	81	08.5	08.3	08.1	07.8	07.6	07.5	+38	44.5	44.3	44.3	44.3	44.4	44.6
2.1	Nunki	50	76	52.0	51.8	51.6	51.3	51.1	50.9	−26	21.1	21.1	21.1	21.1	21.0	21.0
2.7	ζ Sagittarii		75	02.8	02.7	02.5	02.1	01.9	01.7	−29	56.7	56.6	56.6	56.6	56.5	56.5
3.0	ζ Aquilæ		74	09.3	09.2	09.0	08.7	08.5	08.3	+13	47.8	47.7	47.7	47.7	47.8	47.9
3.0	π Sagittarii		73	12.8	12.7	12.5	12.2	11.9	11.8	−21	05.7	05.7	05.7	05.6	05.6	05.5
3.2	β Cygni		67	46.0	45.9	45.7	45.4	45.2	45.0	+27	52.0	51.9	51.8	51.8	51.9	52.1
3.0	δ Cygni		64	06.3	06.2	06.0	05.7	05.4	05.2	+45	01.4	01.3	01.2	01.2	01.3	01.4
2.8	γ Aquilæ		63	57.6	57.5	57.3	57.0	56.8	56.6	+10	30.3	30.3	30.2	30.2	30.3	30.4
0.9	Altair	51	62	50.5	50.4	50.2	50.0	49.8	49.6	+ 8	45.1	45.0	45.0	45.0	45.1	45.2
2.3	γ Cygni		54	50.5	50.4	50.3	50.0	49.7	49.5	+40	07.0	06.9	06.8	06.8	06.8	07.0
2.1	Peacock	52	54	27.5	27.3	27.1	26.7	26.3	26.0	−56	52.7	52.5	52.4	52.3	52.3	52.3
3.2	α Indi		51	22.9	22.8	22.6	22.2	21.9	21.6	−47	26.8	26.7	26.6	26.5	26.4	26.4
1.3	Deneb	53	50	01.3	01.2	01.1	00.8	00.5	00.3	+45	07.5	07.3	07.2	07.2	07.3	07.4
2.6	ϵ Cygni		48	53.7	53.7	53.5	53.2	53.0	52.8	+33	48.4	48.3	48.2	48.2	48.2	48.4
2.6	α Cephei		40	37.5	37.5	37.4	37.0	36.6	36.2	+62	24.2	24.0	23.9	23.8	23.8	23.9
3.1	β Aquarii		37	41.3	41.3	41.2	41.0	40.8	40.5	− 5	45.9	45.9	45.9	45.8	45.8	45.7
2.5	Enif	54	34	29.6	29.6	29.5	29.3	29.1	28.9	+ 9	40.5	40.4	40.4	40.4	40.4	40.5
3.0	δ Capricorni		33	50.8	50.7	50.7	50.4	50.2	50.0	−16	19.6	19.6	19.6	19.5	19.4	19.3
2.2	Al Na'ir	55	28	38.0	38.0	37.9	37.7	37.4	37.1	−47	10.6	10.4	10.3	10.2	10.1	10.0
2.9	α Tucanæ		26	07.6	07.6	07.5	07.2	06.8	06.4	−60	28.9	28.8	28.6	28.4	28.3	28.3
2.2	β Gruis		19	59.3	59.3	59.3	59.1	58.8	58.5	−47	07.0	06.9	06.8	06.6	06.5	06.4
1.3	Fomalhaut	56	16	11.6	11.6	11.6	11.4	11.2	11.0	−29	51.4	51.3	51.3	51.1	51.0	50.9
2.6	β Pegasi		14	35.4	35.4	35.4	35.2	35.0	34.8	+27	50.9	50.8	50.7	50.6	50.7	50.7
2.6	Markab	57	14	21.4	21.4	21.4	21.3	21.1	20.8	+14	58.2	58.2	58.1	58.1	58.2	58.3
3.4	γ Cephei §		5	37.4	37.9	38.1	37.8	37.1	36.3	+77	23.6	23.5	23.4	23.2	23.1	23.1

*3.0–3.7. §Not suitable for use with H. O. 214.

Mag.	Name and No.		SHA						Declination						
				July	Aug.	Sept.	Oct.	Nov.	Dec.		July	Aug.	Sept.	Oct.	Nov.	Dec.
			°	′	′	′	′	′	′	°	′	′	′	′	′	′
3.1	γ Ursæ Minoris §		129	48.0	48.5	49.0	49.4	49.5	49.4	+71	59.6	59.6	59.6	59.4	59.3	59.1
3.0	γ Lupi §		126	55.9	56.0	56.2	56.3	56.3	56.1	−41	01.5	01.5	01.5	01.4	01.3	01.3
2.3	Alphecca	41	126	46.9	47.0	47.2	47.3	47.3	47.2	+26	51.8	51.8	51.8	51.7	51.6	51.5
2.8	α Serpentis		124	27.7	27.8	27.9	28.0	28.0	27.9	+ 6	33.8	33.8	33.8	33.8	33.7	33.6
3.0	β Trianguli Aust.		122	09.7	09.9	10.2	10.4	10.5	10.3	−63	18.1	18.2	18.1	18.1	17.9	17.8
2.5	δ Scorpii		120	33.1	33.2	33.3	33.4	33.4	33.3	−22	30.0	30.0	30.0	30.0	29.9	29.9
2.8	β Scorpii		119	15.9	16.0	16.1	16.2	16.2	16.1	−19	41.3	41.3	41.3	41.3	41.2	41.3
3.0	δ Ophiuchi		116	58.5	58.6	58.8	58.9	58.9	58.8	− 3	35.0	35.0	34.9	34.9	35.0	35.0
2.9	η Draconis		114	08.6	08.9	09.2	09.5	09.7	09.7	+61	37.0	37.1	37.0	37.0	36.8	36.6
1.2	Antares	42	113	18.3	18.4	18.6	18.7	18.7	18.6	−26	20.3	20.3	20.3	20.2	20.2	20.2
2.8	β Herculis		112	54.3	54.4	54.6	54.7	54.7	54.7	+21	35.1	35.2	35.2	35.2	35.1	35.0
2.9	τ Scorpii		111	41.8	41.9	42.0	42.2	42.2	42.1	−28	07.7	07.7	07.7	07.7	07.6	07.6
2.7	ζ Ophiuchi		111	18.0	18.1	18.2	18.4	18.4	18.3	−10	28.8	28.8	28.8	28.8	28.8	28.8
3.0	ζ Herculis		110	04.9	05.0	05.1	05.3	05.4	05.3	+31	41.0	41.1	41.1	41.1	40.9	40.8
1.9	Atria	43	108	58.0	58.3	58.7	59.1	59.2	59.1	−68	57.2	57.3	57.3	57.2	57.1	57.0
2.4	ε Scorpii		108	09.2	09.3	09.4	09.6	09.6	09.5	−34	13.0	13.0	13.0	13.0	12.9	12.9
3.1	ζ Aræ		106	13.9	14.0	14.2	14.5	14.6	14.5	−55	55.5	55.6	55.6	55.5	55.4	55.3
2.6	Sabik	44	103	01.2	01.2	01.4	01.5	01.6	01.5	−15	40.3	40.3	40.3	40.3	40.3	40.3
Var.*	α Herculis		101	49.5	49.6	49.7	49.9	49.9	49.9	+14	26.5	26.5	26.5	26.5	26.5	26.4
2.8	β Aræ		99	33.9	34.0	34.2	34.4	34.5	34.5	−55	29.5	29.6	29.6	29.6	29.5	29.4
2.8	υ Scorpii		98	02.2	02.3	02.4	02.6	02.7	02.6	−37	15.8	15.8	15.8	15.8	15.8	15.7
3.0	α Aræ		97	52.0	52.1	52.3	52.5	52.6	52.5	−49	50.7	50.7	50.8	50.7	50.6	50.6
3.0	β Draconis		97	37.7	37.9	38.1	38.4	38.6	38.6	+52	20.2	20.3	20.3	20.3	20.2	20.0
1.7	Shaula	45	97	19.5	19.5	19.7	19.9	19.9	19.9	−37	04.4	04.5	04.5	04.5	04.4	04.4
2.1	Rasalhague	46	96	45.7	45.8	45.9	46.1	46.2	46.1	+12	35.6	35.6	35.7	35.6	35.6	35.5
2.0	θ Scorpii		96	26.3	26.4	26.6	26.8	26.9	26.8	−42	58.3	58.4	58.4	58.4	58.3	58.3
2.5	κ Scorpii		95	07.1	07.2	07.3	07.5	07.6	07.5	−39	00.6	00.6	00.6	00.6	00.6	00.5
2.9	β Ophiuchi		94	39.6	39.7	39.8	39.9	40.0	40.0	+ 4	35.2	35.2	35.2	35.2	35.2	35.1
2.4	Eltanin	47	91	05.5	05.6	05.9	06.1	06.3	06.4	+51	29.8	29.9	30.0	30.0	29.9	29.7
3.1	γ Sagittarii		89	14.1	14.1	14.3	14.4	14.5	14.5	−30	25.5	25.6	25.6	25.6	25.5	25.5
2.8	δ Sagittarii		85	26.1	26.2	26.3	26.5	26.6	26.5	−29	50.8	50.9	50.9	50.9	50.8	50.8
2.0	Kaus Australis	48	84	40.0	40.0	40.1	40.3	40.4	40.4	−34	24.4	24.4	24.4	24.4	24.4	24.3
2.9	λ Sagittarii		83	40.0	40.1	40.2	40.3	40.4	40.4	−25	26.8	26.8	26.8	26.8	26.8	26.8
0.1	Vega	49	81	07.4	07.5	07.7	07.9	08.0	08.1	+38	44.7	44.8	44.9	44.9	44.8	44.7
2.1	Nunki	50	76	50.8	50.8	50.9	51.0	51.1	51.2	−26	21.0	21.0	21.1	21.1	21.1	21.0
2.7	ζ Sagittarii		75	01.6	01.6	01.7	01.9	02.0	02.0	−29	56.5	56.6	56.6	56.6	56.6	56.6
3.0	ζ Aquilæ		74	08.3	08.3	08.4	08.5	08.6	08.7	+13	48.0	48.1	48.2	48.2	48.1	48.0
3.0	π Sagittarii		73	11.7	11.7	11.8	11.9	12.0	12.0	−21	05.5	05.5	05.5	05.6	05.6	05.5
3.2	β Cygni		67	44.9	44.9	45.0	45.2	45.3	45.4	+27	52.2	52.3	52.4	52.4	52.4	52.3
3.0	δ Cygni		64	05.1	05.1	05.3	05.5	05.7	05.8	+45	01.6	01.7	01.8	01.9	01.9	01.8
2.8	γ Aquilæ		63	56.5	56.5	56.6	56.7	56.8	56.9	+10	30.5	30.6	30.7	30.7	30.7	30.6
0.9	Altair	51	62	49.5	49.5	49.5	49.7	49.8	49.8	+ 8	45.3	45.4	45.4	45.5	45.4	45.4
2.3	γ Cygni		54	49.3	49.3	49.4	49.6	49.8	49.9	+40	07.1	07.3	07.4	07.5	07.4	07.4
2.1	Peacock	52	54	25.7	25.7	25.8	26.0	26.2	26.4	−56	52.4	52.5	52.6	52.6	52.6	52.5
3.2	α Indi		51	21.4	21.4	21.4	21.6	21.8	21.9	−47	26.5	26.5	26.6	26.7	26.7	26.6
1.3	Deneb	53	50	00.1	00.1	00.2	00.3	00.5	00.7	+45	07.5	07.7	07.9	07.9	07.9	07.9
2.6	ε Cygni		48	52.6	52.6	52.6	52.8	52.9	53.1	+33	48.5	48.7	48.8	48.8	48.8	48.8
2.6	α Cephei		40	36.0	35.9	36.0	36.3	36.6	36.9	+62	24.1	24.3	24.4	24.6	24.6	24.6
3.1	β Aquarii		37	40.4	40.3	40.3	40.4	40.5	40.6	− 5	45.6	45.5	45.5	45.5	45.5	45.6
2.5	Enif	54	34	28.7	28.6	28.6	28.7	28.8	28.9	+ 9	40.6	40.7	40.8	40.9	40.8	40.8
3.0	δ Capricorni		33	49.8	49.7	49.7	49.7	49.9	50.0	−16	19.3	19.3	19.3	19.3	19.3	19.4
2.2	Al Na'ir	55	28	36.8	36.7	36.6	36.7	36.9	37.1	−47	10.0	10.1	10.2	10.3	10.3	10.3
2.9	α Tucanæ		26	06.1	05.9	05.9	06.0	06.3	06.5	−60	28.3	28.4	28.5	28.6	28.7	28.6
2.2	β Gruis		19	58.2	58.0	58.0	58.1	58.2	58.4	−47	06.4	06.4	06.5	06.6	06.7	06.7
1.3	Fomalhaut	56	16	10.7	10.5	10.5	10.5	10.6	10.7	−29	50.9	50.9	50.9	51.0	51.1	51.1
2.6	β Pegasi		14	34.5	34.4	34.3	34.4	34.4	34.6	+27	50.9	51.0	51.1	51.2	51.2	51.2
2.6	Markab	57	14	20.6	20.5	20.4	20.4	20.5	20.6	+14	58.4	58.5	58.6	58.6	58.6	58.6
3.4	γ Cephei §		5	35.6	35.1	34.9	35.0	35.4	36.0	+77	23.2	23.4	23.6	23.8	23.9	24.0

*3.0–3.7. §Not suitable for use with H. O. 214.

°	h m	°	h m	°	h m	°	h m	°	h m	°	h m
0	0 00	60	4 00	120	8 00	180	12 00	240	16 00	300	20 00
1	0 04	61	4 04	121	8 04	181	12 04	241	16 04	301	20 04
2	0 08	62	4 08	122	8 08	182	12 08	242	16 08	302	20 08
3	0 12	63	4 12	123	8 12	183	12 12	243	16 12	303	20 12
4	0 16	64	4 16	124	8 16	184	12 16	244	16 16	304	20 16
5	0 20	65	4 20	125	8 20	185	12 20	245	16 20	305	20 20
6	0 24	66	4 24	126	8 24	186	12 24	246	16 24	306	20 24
7	0 28	67	4 28	127	8 28	187	12 28	247	16 28	307	20 28
8	0 32	68	4 32	128	8 32	188	12 32	248	16 32	308	20 32
9	0 36	69	4 36	129	8 36	189	12 36	249	16 36	309	20 36
10	0 40	70	4 40	130	8 40	190	12 40	250	16 40	310	20 40
11	0 44	71	4 44	131	8 44	191	12 44	251	16 44	311	20 44
12	0 48	72	4 48	132	8 48	192	12 48	252	16 48	312	20 48
13	0 52	73	4 52	133	8 52	193	12 52	253	16 52	313	20 52
14	0 56	74	4 56	134	8 56	194	12 56	254	16 56	314	20 56
15	1 00	75	5 00	135	9 00	195	13 00	255	17 00	315	21 00
16	1 04	76	5 04	136	9 04	196	13 04	256	17 04	316	21 04
17	1 08	77	5 08	137	9 08	197	13 08	257	17 08	317	21 08
18	1 12	78	5 12	138	9 12	198	13 12	258	17 12	318	21 12
19	1 16	79	5 16	139	9 16	199	13 16	259	17 16	319	21 16
20	1 20	80	5 20	140	9 20	200	13 20	260	17 20	320	21 20
21	1 24	81	5 24	141	9 24	201	13 24	261	17 24	321	21 24
22	1 28	82	5 28	142	9 28	202	13 28	262	17 28	322	21 28
23	1 32	83	5 32	143	9 32	203	13 32	263	17 32	323	21 32
24	1 36	84	5 36	144	9 36	204	13 36	264	17 36	324	21 36
25	1 40	85	5 40	145	9 40	205	13 40	265	17 40	325	21 40
26	1 44	86	5 44	146	9 44	206	13 44	266	17 44	326	21 44
27	1 48	87	5 48	147	9 48	207	13 48	267	17 48	327	21 48
28	1 52	88	5 52	148	9 52	208	13 52	268	17 52	328	21 52
29	1 56	89	5 56	149	9 56	209	13 56	269	17 56	329	21 56
30	2 00	90	6 00	150	10 00	210	14 00	270	18 00	330	22 00
31	2 04	91	6 04	151	10 04	211	14 04	271	18 04	331	22 04
32	2 08	92	6 08	152	10 08	212	14 08	272	18 08	332	22 08
33	2 12	93	6 12	153	10 12	213	14 12	273	18 12	333	22 12
34	2 16	94	6 16	154	10 16	214	14 16	274	18 16	334	22 16
35	2 20	95	6 20	155	10 20	215	14 20	275	18 20	335	22 20
36	2 24	96	6 24	156	10 24	216	14 24	276	18 24	336	22 24
37	2 28	97	6 28	157	10 28	217	14 28	277	18 28	337	22 28
38	2 32	98	6 32	158	10 32	218	14 32	278	18 32	338	22 32
39	2 36	99	6 36	159	10 36	219	14 36	279	18 36	339	22 36
40	2 40	100	6 40	160	10 40	220	14 40	280	18 40	340	22 40
41	2 44	101	6 44	161	10 44	221	14 44	281	18 44	341	22 44
42	2 48	102	6 48	162	10 48	222	14 48	282	18 48	342	22 48
43	2 52	103	6 52	163	10 52	223	14 52	283	18 52	343	22 52
44	2 56	104	6 56	164	10 56	224	14 56	284	18 56	344	22 56
45	3 00	105	7 00	165	11 00	225	15 00	285	19 00	345	23 00
46	3 04	106	7 04	166	11 04	226	15 04	286	19 04	346	23 04
47	3 08	107	7 08	167	11 08	227	15 08	287	19 08	347	23 08
48	3 12	108	7 12	168	11 12	228	15 12	288	19 12	348	23 12
49	3 16	109	7 16	169	11 16	229	15 16	289	19 16	349	23 16
50	3 20	110	7 20	170	11 20	230	15 20	290	19 20	350	23 20
51	3 24	111	7 24	171	11 24	231	15 24	291	19 24	351	23 24
52	3 28	112	7 28	172	11 28	232	15 28	292	19 28	352	23 28
53	3 32	113	7 32	173	11 32	233	15 32	293	19 32	353	23 32
54	3 36	114	7 36	174	11 36	234	15 36	294	19 36	354	23 36
55	3 40	115	7 40	175	11 40	235	15 40	295	19 40	355	23 40
56	3 44	116	7 44	176	11 44	236	15 44	296	19 44	356	23 44
57	3 48	117	7 48	177	11 48	237	15 48	297	19 48	357	23 48
58	3 52	118	7 52	178	11 52	238	15 52	298	19 52	358	23 52
59	3 56	119	7 56	179	11 56	239	15 56	299	19 56	359	23 56
60	4 00	120	8 00	180	12 00	240	16 00	300	20 00	360	24 00

′	m s
0	0 00
1	0 04
2	0 08
3	0 12
4	0 16
5	0 20
6	0 24
7	0 28
8	0 32
9	0 36
10	0 40
11	0 44
12	0 48
13	0 52
14	0 56
15	1 00
16	1 04
17	1 08
18	1 12
19	1 16
20	1 20
21	1 24
22	1 28
23	1 32
24	1 36
25	1 40
26	1 44
27	1 48
28	1 52
29	1 56
30	2 00
31	2 04
32	2 08
33	2 12
34	2 16
35	2 20
36	2 24
37	2 28
38	2 32
39	2 36
40	2 40
41	2 44
42	2 48
43	2 52
44	2 56
45	3 00
46	3 04
47	3 08
48	3 12
49	3 16
50	3 20
51	3 24
52	3 28
53	3 32
54	3 36
55	3 40
56	3 44
57	3 48
58	3 52
59	3 56
60	4 00

″	s
0	0.00
1	0.07
2	0.13
3	0.20
4	0.27
5	0.33
6	0.40
7	0.47
8	0.53
9	0.60
10	0.67
11	0.73
12	0.80
13	0.87
14	0.93
15	1.00
16	1.07
17	1.13
18	1.20
19	1.27
20	1.33
21	1.40
22	1.47
23	1.53
24	1.60
25	1.67
26	1.73
27	1.80
28	1.87
29	1.93
30	2.00
31	2.07
32	2.13
33	2.20
34	2.27
35	2.33
36	2.40
37	2.47
38	2.53
39	2.60
40	2.67
41	2.73
42	2.80
43	2.87
44	2.93
45	3.00
46	3.07
47	3.13
48	3.20
49	3.27
50	3.33
51	3.40
52	3.47
53	3.53
54	3.60
55	3.67
56	3.73
57	3.80
58	3.87
59	3.93
60	4.00

[When the sign is plus, Polaris is east of north; when the sign is minus, it is west of north]

LHA ♈ \ Lat.	+10°	+15°	+20°	+25°	+30°	+35°	+40°	+45°	+50°	+55°	+60°	+65°	+70°
°	°	°	°	°	°	°	°	°	°	°	°	°	°
0	+0.5	+0.5	+0.5	+0.5	+0.5	+0.6	+0.6	+0.6	+0.7	+0.8	+0.9	+1.1	+1.4
10	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.5	0.5	0.6	0.7	0.9
20	+0.1	+0.1	+0.1	+0.2	+0.2	+0.2	+0.2	+0.2	+0.2	+0.2	+0.3	+0.3	+0.4
30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	−0.1	−0.1	−0.1
40	−0.2	−0.2	−0.2	−0.2	−0.2	−0.2	−0.2	−0.3	−0.3	−0.3	−0.4	−0.5	−0.6
50	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.6	0.7	0.8	1.0
60	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.7	0.8	0.9	1.0	1.2	1.5
70	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.9	1.0	1.1	1.3	1.5	1.9
80	−0.7	−0.8	−0.8	−0.8	−0.9	−0.9	−1.0	−1.0	−1.2	−1.3	−1.5	−1.8	−2.2
90	0.8	0.9	0.9	0.9	1.0	1.0	1.1	1.2	1.3	1.5	1.7	2.0	2.5
100	0.9	0.9	0.9	1.0	1.0	1.1	1.2	1.3	1.4	1.6	1.8	2.1	2.6
110	0.9	1.0	1.0	1.0	1.1	1.1	1.2	1.3	1.4	1.6	1.9	2.2	2.7
120	−1.0	−1.0	−1.0	−1.0	−1.1	−1.1	−1.2	−1.3	−1.5	−1.6	−1.9	−2.2	−2.7
130	0.9	1.0	1.0	1.0	1.1	1.1	1.2	1.3	1.4	1.6	1.8	2.2	2.7
140	0.9	0.9	0.9	1.0	1.0	1.1	1.1	1.2	1.3	1.5	1.7	2.0	2.5
150	0.8	0.8	0.8	0.9	0.9	1.0	1.0	1.1	1.2	1.4	1.6	1.9	2.3
160	−0.7	−0.7	−0.7	−0.8	−0.8	−0.9	−0.9	−1.0	−1.1	−1.2	−1.4	−1.6	−2.0
170	0.6	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.9	1.0	1.1	1.3	1.6
180	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.7	0.8	0.9	1.0	1.3
190	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.5	0.5	0.6	0.7	0.8
200	−0.1	−0.1	−0.1	−0.2	−0.2	−0.2	−0.2	−0.2	−0.2	−0.2	−0.3	−0.3	−0.4
210	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	+0.1	+0.1	+0.1
220	+0.2	+0.2	+0.2	+0.2	+0.2	+0.2	+0.2	+0.3	+0.3	+0.3	0.4	0.4	0.5
230	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.6	0.7	0.8	1.0
240	+0.5	+0.5	+0.5	+0.5	+0.6	+0.6	+0.6	+0.7	+0.8	+0.8	+1.0	+1.1	+1.4
250	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.9	1.0	1.1	1.2	1.4	1.8
260	0.7	0.8	0.8	0.8	0.8	0.9	1.0	1.0	1.1	1.3	1.4	1.7	2.1
270	0.8	0.9	0.9	0.9	0.9	1.0	1.1	1.2	1.3	1.4	1.6	1.9	2.4
280	+0.9	+0.9	+0.9	+1.0	+1.0	+1.1	+1.2	+1.3	+1.4	+1.5	+1.8	+2.1	+2.6
290	0.9	1.0	1.0	1.0	1.1	1.1	1.2	1.3	1.4	1.6	1.8	2.2	2.7
300	1.0	1.0	1.0	1.0	1.1	1.1	1.2	1.3	1.5	1.6	1.9	2.2	2.7
310	0.9	1.0	1.0	1.0	1.1	1.1	1.2	1.3	1.4	1.6	1.8	2.2	2.7
320	+0.9	+0.9	+0.9	+1.0	+1.0	+1.1	+1.1	+1.2	+1.4	+1.5	+1.8	+2.1	+2.6
330	0.8	0.8	0.9	0.9	0.9	1.0	1.0	1.1	1.3	1.4	1.6	1.9	2.4
340	0.7	0.7	0.7	0.8	0.8	0.9	0.9	1.0	1.1	1.2	1.4	1.7	2.1
350	0.6	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.9	1.0	1.2	1.4	1.8
360	+0.5	+0.5	+0.5	+0.5	+0.5	+0.6	+0.6	+0.6	+0.7	+0.8	+0.9	+1.1	+1.4

FIRST CORRECTION TO CORRECTED ALTITUDE

L H A ♈	Corr.	L H A ♈	Corr.	L H A ♈	Corr.	L H A ♈	Corr.	L H A ♈	Corr.	L H A ♈	Corr.
°	′	°	′	°	′	°	′	°	′	°	′
0	−49.4	60	−47.8	120	+ 2.0	180	+49.6	240	+48.1	300	− 1.1
1	49.9	61	47.3	121	3.0	181	50.0	241	47.6	301	2.1
2	50.3	62	46.7	122	4.0	182	50.5	242	47.0	302	3.0
3	50.8	63	46.2	123	5.0	183	50.9	243	46.5	303	4.0
4	51.2	64	45.6	124	5.9	184	51.3	244	45.9	304	5.0
5	−51.6	65	−45.0	125	+ 6.9	185	+51.7	245	+45.4	305	− 6.0
6	51.9	66	44.4	126	7.9	186	52.1	246	44.8	306	7.0
7	52.3	67	43.8	127	8.8	187	52.4	247	44.2	307	8.0
8	52.7	68	43.2	128	9.8	188	52.8	248	43.6	308	8.9
9	53.0	69	42.5	129	10.8	189	53.1	249	42.9	309	9.9
10	−53.3	70	−41.9	130	+11.7	190	+53.4	250	+42.3	310	−10.8
11	53.6	71	41.2	131	12.7	191	53.7	251	41.6	311	11.8
12	53.9	72	40.6	132	13.6	192	54.0	252	41.0	312	12.8
13	54.2	73	39.8	133	14.6	193	54.3	253	40.3	313	13.7
14	54.5	74	39.2	134	15.5	194	54.5	254	39.6	314	14.7
15	−54.7	75	−38.4	135	+16.5	195	+54.8	255	+38.9	315	−15.6
16	54.9	76	37.7	136	17.4	196	55.0	256	38.2	316	16.6
17	55.1	77	37.0	137	18.3	197	55.2	257	37.5	317	17.5
18	55.3	78	36.2	138	19.3	198	55.4	258	36.8	318	18.5
19	55.5	79	35.4	139	20.2	199	55.5	259	36.0	319	19.4
20	−55.6	80	−34.7	140	+21.1	200	+55.7	260	+35.3	320	−20.3
21	55.8	81	33.9	141	22.0	201	55.8	261	34.5	321	21.2
22	55.9	82	33.1	142	22.9	202	55.9	262	33.7	322	22.1
23	56.0	83	32.3	143	23.8	203	56.0	263	32.9	323	23.0
24	56.1	84	31.5	144	24.7	204	56.1	264	32.1	324	23.9
25	−56.2	85	−30.7	145	+25.6	205	+56.2	265	+31.3	325	−24.8
26	56.2	86	29.8	146	26.4	206	56.2	266	30.5	326	25.7
27	56.2	87	29.0	147	27.3	207	56.2	267	29.7	327	26.6
28	56.3	88	28.2	148	28.1	208	56.3	268	28.8	328	27.4
29	56.3	89	27.3	149	29.0	209	56.3	269	28.0	329	28.3
30	−56.2	90	−26.4	150	+29.8	210	+56.2	270	+27.1	330	−29.1
31	56.2	91	25.6	151	30.6	211	56.2	271	26.3	331	30.0
32	56.2	92	24.7	152	31.4	212	56.2	272	25.4	332	30.8
33	56.1	93	23.8	153	32.2	213	56.1	273	24.5	333	31.6
34	56.0	94	22.9	154	33.0	214	56.0	274	23.6	334	32.4
35	−55.9	95	−22.0	155	+33.8	215	+55.9	275	+22.8	335	−33.2
36	55.8	96	21.1	156	34.6	216	55.8	276	21.9	336	34.0
37	55.6	97	20.2	157	35.4	217	55.6	277	21.0	337	34.8
38	55.5	98	19.2	158	36.1	218	55.5	278	20.0	338	35.6
39	55.3	99	18.3	159	36.9	219	55.3	279	19.1	339	36.3
40	−55.1	100	−17.4	160	+37.6	220	+55.1	280	+18.2	340	−37.1
41	54.9	101	16.4	161	38.3	221	54.9	281	17.3	341	37.8
42	54.7	102	15.5	162	39.0	222	54.7	282	16.3	342	38.5
43	54.4	103	14.5	163	39.7	223	54.5	283	15.4	343	39.3
44	54.2	104	13.6	164	40.4	224	54.2	284	14.4	344	40.0
45	−53.9	105	−12.6	165	+41.1	225	+54.0	285	+13.5	345	−40.7
46	53.6	106	11.7	166	41.7	226	53.7	286	12.5	346	41.3
47	53.3	107	10.7	167	42.4	227	53.4	287	11.6	347	42.0
48	53.0	108	9.7	168	43.0	228	53.1	288	10.6	348	42.6
49	52.6	109	8.8	169	43.6	229	52.7	289	9.6	349	43.3
50	−52.3	110	− 7.8	170	+44.3	230	+52.4	290	+ 8.7	350	−43.9
51	51.9	111	6.8	171	44.9	231	52.0	291	7.7	351	44.5
52	51.5	112	5.8	172	45.4	232	51.6	292	6.8	352	45.1
53	51.1	113	4.9	173	46.0	233	51.2	293	5.8	353	45.7
54	50.7	114	3.9	174	46.6	234	50.8	294	4.8	354	46.3
55	−50.2	115	− 2.9	175	+47.1	235	+50.4	295	+ 3.8	355	−46.8
56	49.8	116	1.9	176	47.6	236	50.0	296	2.8	356	47.4
57	49.3	117	− 0.9	177	48.2	237	49.5	297	1.8	357	47.9
58	48.8	118	0.0	178	48.6	238	49.0	298	+ 0.9	358	48.4
59	48.4	119	+ 1.0	179	49.1	239	48.6	299	− 0.1	359	48.9
60	−47.8	120	+ 2.0	180	+49.6	240	+48.1	300	− 1.1	360	−49.4

LATITUDE BY POLARIS, 1956

SECOND CORRECTION TO CORRECTED ALTITUDE

LHAT \ Date	Jan. 1	Feb. 1	Mar. 1	Apr. 1	May 1	June 1	July 1	Aug. 1	Sept. 1	Oct. 1	Nov. 1	Dec. 1	Dec.32
°	′	′	′	′	′	′	′	′	′	′	′	′	′
0	+0.2	+0.1	0.0	−0.2	−0.3	−0.4	−0.4	−0.3	−0.1	+0.1	+0.3	+0.4	+0.5
20	+0.2	+0.2	+0.1	−0.1	−0.2	−0.3	−0.4	−0.3	−0.2	0.0	+0.2	+0.3	+0.5
40	+0.2	+0.2	+0.2	+0.1	−0.1	−0.2	−0.3	−0.3	−0.3	−0.1	+0.1	+0.2	+0.4
60	+0.1	+0.2	+0.3	+0.2	+0.1	−0.1	−0.2	−0.3	−0.3	−0.2	−0.1	+0.1	+0.3
80	+0.1	+0.2	+0.3	+0.3	+0.2	0.0	−0.1	−0.2	−0.3	−0.3	−0.2	−0.1	+0.1
100	0.0	+0.2	+0.3	+0.4	+0.3	+0.2	0.0	−0.2	−0.3	−0.3	−0.3	−0.2	−0.1
120	0.0	+0.1	+0.3	+0.4	+0.4	+0.3	+0.1	−0.1	−0.2	−0.3	−0.4	−0.3	−0.2
140	−0.1	+0.1	+0.2	+0.3	+0.4	+0.4	+0.2	+0.1	−0.1	−0.3	−0.4	−0.4	−0.4
160	−0.1	0.0	+0.1	+0.3	+0.4	+0.4	+0.3	+0.2	0.0	−0.2	−0.4	−0.5	−0.4
180	−0.2	−0.1	0.0	+0.2	+0.3	+0.4	+0.4	+0.3	+0.1	−0.1	−0.3	−0.4	−0.5
200	−0.2	−0.2	−0.1	+0.1	+0.2	+0.3	+0.4	+0.3	+0.2	0.0	−0.2	−0.3	−0.5
220	−0.2	−0.2	−0.2	−0.1	+0.1	+0.2	+0.3	+0.3	+0.3	+0.1	−0.1	−0.2	−0.4
240	−0.1	−0.2	−0.3	−0.2	−0.1	+0.1	+0.2	+0.3	+0.3	+0.2	+0.1	−0.1	−0.3
260	−0.1	−0.2	−0.3	−0.3	−0.2	0.0	+0.1	+0.2	+0.3	+0.3	+0.2	+0.1	−0.1
280	0.0	−0.2	−0.3	−0.4	−0.3	−0.2	0.0	+0.2	+0.3	+0.3	+0.3	+0.2	+0.1
300	0.0	−0.1	−0.3	−0.4	−0.4	−0.3	−0.1	+0.1	+0.2	+0.3	+0.4	+0.3	+0.2
320	+0.1	−0.1	−0.2	−0.3	−0.4	−0.4	−0.2	−0.1	+0.1	+0.3	+0.4	+0.4	+0.4
340	+0.1	0.0	−0.1	−0.3	−0.4	−0.4	−0.3	−0.2	0.0	+0.2	+0.4	+0.5	+0.4
360	+0.2	+0.1	0.0	−0.2	−0.3	−0.4	−0.4	−0.3	−0.1	+0.1	+0.3	+0.4	+0.5

LATITUDE BY POLARIS, 1956

THIRD CORRECTION TO CORRECTED ALTITUDE

LHAT \ Altitude	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°
°	′	′	′	′	′	′	′	′	′	′	′	′	′
0	−0.1	−0.1	−0.1	−0.1	0.0	0.0	0.0	0.0	0.0	0.0	+0.1	+0.1	+0.2
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60	−0.1	−0.1	−0.1	−0.1	−0.1	0.0	0.0	0.0	0.0	+0.1	+0.1	+0.2	+0.2
80	−0.2	−0.2	−0.2	−0.1	−0.1	−0.1	0.0	0.0	+0.1	+0.1	+0.2	+0.3	+0.5
100	−0.3	−0.3	−0.2	−0.2	−0.2	−0.1	−0.1	0.0	+0.1	+0.2	+0.3	+0.5	+0.7
120	−0.4	−0.3	−0.3	−0.2	−0.2	−0.1	−0.1	0.0	+0.1	+0.2	+0.3	+0.6	+0.8
140	−0.3	−0.3	−0.3	−0.2	−0.2	−0.1	−0.1	0.0	+0.1	+0.2	+0.3	+0.5	+0.7
160	−0.2	−0.2	−0.2	−0.1	−0.1	−0.1	0.0	0.0	+0.1	+0.1	+0.2	+0.3	+0.4
180	−0.1	−0.1	−0.1	−0.1	0.0	0.0	0.0	0.0	0.0	0.0	+0.1	+0.1	+0.2
200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
220	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
240	−0.1	−0.1	−0.1	−0.1	−0.1	0.0	0.0	0.0	0.0	+0.1	+0.1	+0 2	+0.2
260	−0.2	−0.2	−0.2	−0.1	−0.1	−0.1	0.0	0.0	+0.1	+0.1	+0.2	+0.3	+0.5
280	−0.3	−0.3	−0.2	−0.2	−0.2	−0.1	−0.1	0.0	+0.1	+0.2	+0.3	+0.5	+0.7
300	−0.4	−0.3	−0.3	−0.2	−0.2	−0.1	−0.1	0.0	+0.1	+0.2	+0.3	+0.6	+0.8
320	−0.3	−0.3	−0.3	−0.2	−0.2	−0.1	−0.1	0.0	+0.1	+0.2	+0.3	+0.5	+0.7
340	−0.2	−0.2	−0.2	−0.1	−0.1	−0.1	0.0	0.0	+0.1	+0.1	+0.2	+0.3	+0.4
360	−0.1	−0.1	−0.1	−0.1	0.0	0.0	0.0	0.0	0.0	0.0	+0.1	+0.1	+0.2

292626 O - 55 - 18

0m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	0 00.0	0 00.0	0 00.0	0	0.0	60	0.1	120	0.1
1	0 00.3	0 00.3	0 00.2	1	0.0	61	0.1	121	0.1
2	0 00.5	0 00.5	0 00.5	2	0.0	62	0.1	122	0.1
3	0 00.8	0 00.8	0 00.7	3	0.0	63	0.1	123	0.1
4	0 01.0	0 01.0	0 01.0	4	0.0	64	0.1	124	0.1
5	0 01.3	0 01.3	0 01.2	5	0.0	65	0.1	125	0.1
6	0 01.5	0 01.5	0 01.4	6	0.0	66	0.1	126	0.1
7	0 01.8	0 01.8	0 01.7	7	0.0	67	0.1	127	0.1
8	0 02.0	0 02.0	0 01.9	8	0.0	68	0.1	128	0.1
9	0 02.3	0 02.3	0 02.1	9	0.0	69	0.1	129	0.1
10	0 02.5	0 02.5	0 02.4	10	0.0	70	0.1	130	0.1
11	0 02.8	0 02.8	0 02.6	11	0.0	71	0.1	131	0.1
12	0 03.0	0 03.0	0 02.9	12	0.0	72	0.1	132	0.1
13	0 03.3	0 03.3	0 03.1	13	0.0	73	0.1	133	0.1
14	0 03.5	0 03.5	0 03.3	14	0.0	74	0.1	134	0.1
15	0 03.8	0 03.8	0 03.6	15	0.0	75	0.1	135	0.1
16	0 04.0	0 04.0	0 03.8	16	0.0	76	0.1	136	0.1
17	0 04.3	0 04.3	0 04.1	17	0.0	77	0.1	137	0.1
18	0 04.5	0 04.5	0 04.3	18	0.0	78	0.1	138	0.1
19	0 04.8	0 04.8	0 04.5	19	0.0	79	0.1	139	0.1
20	0 05.0	0 05.0	0 04.8	20	0.0	80	0.1	140	0.1
21	0 05.3	0 05.3	0 05.0	21	0.0	81	0.1	141	0.1
22	0 05.5	0 05.5	0 05.2	22	0.0	82	0.1	142	0.1
23	0 05.8	0 05.8	0 05.5	23	0.0	83	0.1	143	0.1
24	0 06.0	0 06.0	0 05.7	24	0.0	84	0.1	144	0.1
25	0 06.3	0 06.3	0 06.0	25	0.0	85	0.1	145	0.1
26	0 06.5	0 06.5	0 06.2	26	0.0	86	0.1	146	0.1
27	0 06.8	0 06.8	0 06.4	27	0.0	87	0.1	147	0.1
28	0 07.0	0 07.0	0 06.7	28	0.0	88	0.1	148	0.1
29	0 07.3	0 07.3	0 06.9	29	0.0	89	0.1	149	0.1
30	0 07.5	0 07.5	0 07.2	30	0.0	90	0.1	150	0.1
31	0 07.8	0 07.8	0 07.4	31	0.0	91	0.1	151	0.1
32	0 08.0	0 08.0	0 07.6	32	0.0	92	0.1	152	0.1
33	0 08.3	0 08.3	0 07.9	33	0.0	93	0.1	153	0.1
34	0 08.5	0 08.5	0 08.1	34	0.0	94	0.1	154	0.1
35	0 08.8	0 08.8	0 08.4	35	0.0	95	0.1	155	0.1
36	0 09.0	0 09.0	0 08.6	36	0.0	96	0.1	156	0.1
37	0 09.3	0 09.3	0 08.8	37	0.0	97	0.1	157	0.1
38	0 09.5	0 09.5	0 09.1	38	0.0	98	0.1	158	0.1
39	0 09.8	0 09.8	0 09.3	39	0.0	99	0.1	159	0.1
40	0 10.0	0 10.0	0 09.5	40	0.0	100	0.1	160	0.1
41	0 10.3	0 10.3	0 09.8	41	0.0	101	0.1	161	0.1
42	0 10.5	0 10.5	0 10.0	42	0.0	102	0.1	162	0.1
43	0 10.8	0 10.8	0 10.3	43	0.0	103	0.1	163	0.1
44	0 11.0	0 11.0	0 10.5	44	0.0	104	0.1	164	0.1
45	0 11.3	0 11.3	0 10.7	45	0.0	105	0.1	165	0.1
46	0 11.5	0 11.5	0 11.0	46	0.0	106	0.1	166	0.1
47	0 11.8	0 11.8	0 11.2	47	0.0	107	0.1	167	0.1
48	0 12.0	0 12.0	0 11.5	48	0.0	108	0.1	168	0.1
49	0 12.3	0 12.3	0 11.7	49	0.0	109	0.1	169	0.1
50	0 12.5	0 12.5	0 11.9	50	0.0	110	0.1	170	0.1
51	0 12.8	0 12.8	0 12.2	51	0.0	111	0.1	171	0.1
52	0 13.0	0 13.0	0 12.4	52	0.0	112	0.1	172	0.1
53	0 13.3	0 13.3	0 12.6	53	0.0	113	0.1	173	0.1
54	0 13.5	0 13.5	0 12.9	54	0.0	114	0.1	174	0.1
55	0 13.8	0 13.8	0 13.1	55	0.0	115	0.1	175	0.1
56	0 14.0	0 14.0	0 13.4	56	0.0	116	0.1	176	0.1
57	0 14.3	0 14.3	0 13.6	57	0.0	117	0.1	177	0.1
58	0 14.5	0 14.5	0 13.8	58	0.0	118	0.1	178	0.1
59	0 14.8	0 14.8	0 14.1	59	0.0	119	0.1	179	0.1
60	0 15.0	0 15.0	0 14.3	60	0.1	120	0.1	180	0.2

1m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	0 15.0	0 15.0	0 14.3	0	0.0	60	0.2	120	0.3
1	0 15.3	0 15.3	0 14.6	1	0.0	61	0.2	121	0.3
2	0 15.5	0 15.5	0 14.8	2	0.0	62	0.2	122	0.3
3	0 15.8	0 15.8	0 15.0	3	0.0	63	0.2	123	0.3
4	0 16.0	0 16.0	0 15.3	4	0.0	64	0.2	124	0.3
5	0 16.3	0 16.3	0 15.5	5	0.0	65	0.2	125	0.3
6	0 16.5	0 16.5	0 15.7	6	0.0	66	0.2	126	0.3
7	0 16.8	0 16.8	0 16.0	7	0.0	67	0.2	127	0.3
8	0 17.0	0 17.0	0 16.2	8	0.0	68	0.2	128	0.3
9	0 17.3	0 17.3	0 16.5	9	0.0	69	0.2	129	0.3
10	0 17.5	0 17.5	0 16.7	10	0.0	70	0.2	130	0.3
11	0 17.8	0 17.8	0 16.9	11	0.0	71	0.2	131	0.3
12	0 18.0	0 18.0	0 17.2	12	0.0	72	0.2	132	0.3
13	0 18.3	0 18.3	0 17.4	13	0.0	73	0.2	133	0.3
14	0 18.5	0 18.6	0 17.7	14	0.0	74	0.2	134	0.3
15	0 18.8	0 18.8	0 17.9	15	0.0	75	0.2	135	0.3
16	0 19.0	0 19.1	0 18.1	16	0.0	76	0.2	136	0.3
17	0 19.3	0 19.3	0 18.4	17	0.0	77	0.2	137	0.3
18	0 19.5	0 19.6	0 18.6	18	0.0	78	0.2	138	0.3
19	0 19.8	0 19.8	0 18.9	19	0.0	79	0.2	139	0.3
20	0 20.0	0 20.1	0 19.1	20	0.1	80	0.2	140	0.4
21	0 20.3	0 20.3	0 19.3	21	0.1	81	0.2	141	0.4
22	0 20.5	0 20.6	0 19.6	22	0.1	82	0.2	142	0.4
23	0 20.8	0 20.8	0 19.8	23	0.1	83	0.2	143	0.4
24	0 21.0	0 21.1	0 20.0	24	0.1	84	0.2	144	0.4
25	0 21.3	0 21.3	0 20.3	25	0.1	85	0.2	145	0.4
26	0 21.5	0 21.6	0 20.5	26	0.1	86	0.2	146	0.4
27	0 21.8	0 21.8	0 20.8	27	0.1	87	0.2	147	0.4
28	0 22.0	0 22.1	0 21.0	28	0.1	88	0.2	148	0.4
29	0 22.3	0 22.3	0 21.2	29	0.1	89	0.2	149	0.4
30	0 22.5	0 22.6	0 21.5	30	0.1	90	0.2	150	0.4
31	0 22.8	0 22.8	0 21.7	31	0.1	91	0.2	151	0.4
32	0 23.0	0 23.1	0 22.0	32	0.1	92	0.2	152	0.4
33	0 23.3	0 23.3	0 22.2	33	0.1	93	0.2	153	0.4
34	0 23.5	0 23.6	0 22.4	34	0.1	94	0.2	154	0.4
35	0 23.8	0 23.8	0 22.7	35	0.1	95	0.2	155	0.4
36	0 24.0	0 24.1	0 22.9	36	0.1	96	0.2	156	0.4
37	0 24.3	0 24.3	0 23.1	37	0.1	97	0.2	157	0.4
38	0 24.5	0 24.6	0 23.4	38	0.1	98	0.2	158	0.4
39	0 24.8	0 24.8	0 23.6	39	0.1	99	0.2	159	0.4
40	0 25.0	0 25.1	0 23.9	40	0.1	100	0.3	160	0.4
41	0 25.3	0 25.3	0 24.1	41	0.1	101	0.3	161	0.4
42	0 25.5	0 25.6	0 24.3	42	0.1	102	0.3	162	0.4
43	0 25.8	0 25.8	0 24.6	43	0.1	103	0.3	163	0.4
44	0 26.0	0 26.1	0 24.8	44	0.1	104	0.3	164	0.4
45	0 26.3	0 26.3	0 25.1	45	0.1	105	0.3	165	0.4
46	0 26.5	0 26.6	0 25.3	46	0.1	106	0.3	166	0.4
47	0 26.8	0 26.8	0 25.5	47	0.1	107	0.3	167	0.4
48	0 27.0	0 27.1	0 25.8	48	0.1	108	0.3	168	0.4
49	0 27.3	0 27.3	0 26.0	49	0.1	109	0.3	169	0.4
50	0 27.5	0 27.6	0 26.2	50	0.1	110	0.3	170	0.4
51	0 27.8	0 27.8	0 26.5	51	0.1	111	0.3	171	0.4
52	0 28.0	0 28.1	0 26.7	52	0.1	112	0.3	172	0.4
53	0 28.3	0 28.3	0 27.0	53	0.1	113	0.3	173	0.4
54	0 28.5	0 28.6	0 27.2	54	0.1	114	0.3	174	0.4
55	0 28.8	0 28.8	0 27.4	55	0.1	115	0.3	175	0.4
56	0 29.0	0 29.1	0 27.7	56	0.1	116	0.3	176	0.4
57	0 29.3	0 29.3	0 27.9	57	0.1	117	0.3	177	0.4
58	0 29.5	0 29.6	0 28.2	58	0.1	118	0.3	178	0.4
59	0 29.8	0 29.8	0 28.4	59	0.1	119	0.3	179	0.4
60	0 30.0	0 30.1	0 28.6	60	0.2	120	0.3	180	0.5

2m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	0 30.0	0 30.1	0 28.6	0	0.0	60	0.3	120	0.5
1	0 30.3	0 30.3	0 28.9	1	0.0	61	0.3	121	0.5
2	0 30.5	0 30.6	0 29.1	2	0.0	62	0.3	122	0.5
3	0 30.8	0 30.8	0 29.3	3	0.0	63	0.3	123	0.5
4	0 31.0	0 31.1	0 29.6	4	0.0	64	0.3	124	0.5
5	0 31.3	0 31.3	0 29.8	5	0.0	65	0.3	125	0.5
6	0 31.5	0 31.6	0 30.1	6	0.0	66	0.3	126	0.5
7	0 31.8	0 31.8	0 30.3	7	0.0	67	0.3	127	0.5
8	0 32.0	0 32.1	0 30.5	8	0.0	68	0.3	128	0.5
9	0 32.3	0 32.3	0 30.8	9	0.0	69	0.3	129	0.5
10	0 32.5	0 32.6	0 31.0	10	0.0	70	0.3	130	0.5
11	0 32.8	0 32.8	0 31.3	11	0.0	71	0.3	131	0.5
12	0 33.0	0 33.1	0 31.5	12	0.1	72	0.3	132	0.6
13	0 33.3	0 33.3	0 31.7	13	0.1	73	0.3	133	0.6
14	0 33.5	0 33.6	0 32.0	14	0.1	74	0.3	134	0.6
15	0 33.8	0 33.8	0 32.2	15	0.1	75	0.3	135	0.6
16	0 34.0	0 34.1	0 32.5	16	0.1	76	0.3	136	0.6
17	0 34.3	0 34.3	0 32.7	17	0.1	77	0.3	137	0.6
18	0 34.5	0 34.6	0 32.9	18	0.1	78	0.3	138	0.6
19	0 34.8	0 34.8	0 33.2	19	0.1	79	0.3	139	0.6
20	0 35.0	0 35.1	0 33.4	20	0.1	80	0.3	140	0.6
21	0 35.3	0 35.3	0 33.6	21	0.1	81	0.3	141	0.6
22	0 35.5	0 35.6	0 33.9	22	0.1	82	0.3	142	0.6
23	0 35.8	0 35.8	0 34.1	23	0.1	83	0.3	143	0.6
24	0 36.0	0 36.1	0 34.4	24	0.1	84	0.4	144	0.6
25	0 36.3	0 36.3	0 34.6	25	0.1	85	0.4	145	0.6
26	0 36.5	0 36.6	0 34.8	26	0.1	86	0.4	146	0.6
27	0 36.8	0 36.9	0 35.1	27	0.1	87	0.4	147	0.6
28	0 37.0	0 37.1	0 35.3	28	0.1	88	0.4	148	0.6
29	0 37.3	0 37.4	0 35.6	29	0.1	89	0.4	149	0.6
30	0 37.5	0 37.6	0 35.8	30	0.1	90	0.4	150	0.6
31	0 37.8	0 37.9	0 36.0	31	0.1	91	0.4	151	0.6
32	0 38.0	0 38.1	0 36.3	32	0.1	92	0.4	152	0.6
33	0 38.3	0 38.4	0 36.5	33	0.1	93	0.4	153	0.6
34	0 38.5	0 38.6	0 36.7	34	0.1	94	0.4	154	0.6
35	0 38.8	0 38.9	0 37.0	35	0.1	95	0.4	155	0.6
36	0 39.0	0 39.1	0 37.2	36	0.2	96	0.4	156	0.7
37	0 39.3	0 39.4	0 37.5	37	0.2	97	0.4	157	0.7
38	0 39.5	0 39.6	0 37.7	38	0.2	98	0.4	158	0.7
39	0 39.8	0 39.9	0 37.9	39	0.2	99	0.4	159	0.7
40	0 40.0	0 40.1	0 38.2	40	0.2	100	0.4	160	0.7
41	0 40.3	0 40.4	0 38.4	41	0.2	101	0.4	161	0.7
42	0 40.5	0 40.6	0 38.7	42	0.2	102	0.4	162	0.7
43	0 40.8	0 40.9	0 38.9	43	0.2	103	0.4	163	0.7
44	0 41.0	0 41.1	0 39.1	44	0.2	104	0.4	164	0.7
45	0 41.3	0 41.4	0 39.4	45	0.2	105	0.4	165	0.7
46	0 41.5	0 41.6	0 39.6	46	0.2	106	0.4	166	0.7
47	0 41.8	0 41.9	0 39.8	47	0.2	107	0.4	167	0.7
48	0 42.0	0 42.1	0 40.1	48	0.2	108	0.5	168	0.7
49	0 42.3	0 42.4	0 40.3	49	0.2	109	0.5	169	0.7
50	0 42.5	0 42.6	0 40.6	50	0.2	110	0.5	170	0.7
51	0 42.8	0 42.9	0 40.8	51	0.2	111	0.5	171	0.7
52	0 43.0	0 43.1	0 41.0	52	0.2	112	0.5	172	0.7
53	0 43.3	0 43.4	0 41.3	53	0.2	113	0.5	173	0.7
54	0 43.5	0 43.6	0 41.5	54	0.2	114	0.5	174	0.7
55	0 43.8	0 43.9	0 41.8	55	0.2	115	0.5	175	0.7
56	0 44.0	0 44.1	0 42.0	56	0.2	116	0.5	176	0.7
57	0 44.3	0 44.4	0 42.2	57	0.2	117	0.5	177	0.7
58	0 44.5	0 44.6	0 42.5	58	0.2	118	0.5	178	0.7
59	0 44.8	0 44.9	0 42.7	59	0.2	119	0.5	179	0.7
60	0 45.0	0 45.1	0 43.0	60	0.3	120	0.5	180	0.8

3m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	0 45.0	0 45.1	0 43.0	0	0.0	60	0.4	120	0.7
1	0 45.3	0 45.4	0 43.2	1	0.0	61	0.4	121	0.7
2	0 45.5	0 45.6	0 43.4	2	0.0	62	0.4	122	0.7
3	0 45.8	0 45.9	0 43.7	3	0.0	63	0.4	123	0.7
4	0 46.0	0 46.1	0 43.9	4	0.0	64	0.4	124	0.7
5	0 46.3	0 46.4	0 44.1	5	0.0	65	0.4	125	0.7
6	0 46.5	0 46.6	0 44.4	6	0.0	66	0.4	126	0.7
7	0 46.8	0 46.9	0 44.6	7	0.0	67	0.4	127	0.7
8	0 47.0	0 47.1	0 44.9	8	0.0	68	0.4	128	0.7
9	0 47.3	0 47.4	0 45.1	9	0.1	69	0.4	129	0.8
10	0 47.5	0 47.6	0 45.3	10	0.1	70	0.4	130	0.8
11	0 47.8	0 47.9	0 45.6	11	0.1	71	0.4	131	0.8
12	0 48.0	0 48.1	0 45.8	12	0.1	72	0.4	132	0.8
13	0 48.3	0 48.4	0 46.1	13	0.1	73	0.4	133	0.8
14	0 48.5	0 48.6	0 46.3	14	0.1	74	0.4	134	0.8
15	0 48.8	0 48.9	0 46.5	15	0.1	75	0.4	135	0.8
16	0 49.0	0 49.1	0 46.8	16	0.1	76	0.4	136	0.8
17	0 49.3	0 49.4	0 47.0	17	0.1	77	0.4	137	0.8
18	0 49.5	0 49.6	0 47.2	18	0.1	78	0.5	138	0.8
19	0 49.8	0 49.9	0 47.5	19	0.1	79	0.5	139	0.8
20	0 50.0	0 50.1	0 47.7	20	0.1	80	0.5	140	0.8
21	0 50.3	0 50.4	0 48.0	21	0.1	81	0.5	141	0.8
22	0 50.5	0 50.6	0 48.2	22	0.1	82	0.5	142	0.8
23	0 50.8	0 50.9	0 48.4	23	0.1	83	0.5	143	0.8
24	0 51.0	0 51.1	0 48.7	24	0.1	84	0.5	144	0.8
25	0 51.3	0 51.4	0 48.9	25	0.1	85	0.5	145	0.8
26	0 51.5	0 51.6	0 49.2	26	0.2	86	0.5	146	0.9
27	0 51.8	0 51.9	0 49.4	27	0.2	87	0.5	147	0.9
28	0 52.0	0 52.1	0 49.6	28	0.2	88	0.5	148	0.9
29	0 52.3	0 52.4	0 49.9	29	0.2	89	0.5	149	0.9
30	0 52.5	0 52.6	0 50.1	30	0.2	90	0.5	150	0.9
31	0 52.8	0 52.9	0 50.3	31	0.2	91	0.5	151	0.9
32	0 53.0	0 53.1	0 50.6	32	0.2	92	0.5	152	0.9
33	0 53.3	0 53.4	0 50.8	33	0.2	93	0.5	153	0.9
34	0 53.5	0 53.6	0 51.1	34	0.2	94	0.5	154	0.9
35	0 53.8	0 53.9	0 51.3	35	0.2	95	0.6	155	0.9
36	0 54.0	0 54.1	0 51.5	36	0.2	96	0.6	156	0.9
37	0 54.3	0 54.4	0 51.8	37	0.2	97	0.6	157	0.9
38	0 54.5	0 54.6	0 52.0	38	0.2	98	0.6	158	0.9
39	0 54.8	0 54.9	0 52.3	39	0.2	99	0.6	159	0.9
40	0 55.0	0 55.2	0 52.5	40	0.2	100	0.6	160	0.9
41	0 55.3	0 55.4	0 52.7	41	0.2	101	0.6	161	0.9
42	0 55.5	0 55.7	0 53.0	42	0.2	102	0.6	162	0.9
43	0 55.8	0 55.9	0 53.2	43	0.3	103	0.6	163	1.0
44	0 56.0	0 56.2	0 53.4	44	0.3	104	0.6	164	1.0
45	0 56.3	0 56.4	0 53.7	45	0.3	105	0.6	165	1.0
46	0 56.5	0 56.7	0 53.9	46	0.3	106	0.6	166	1.0
47	0 56.8	0 56.9	0 54.2	47	0.3	107	0.6	167	1.0
48	0 57.0	0 57.2	0 54.4	48	0.3	108	0.6	168	1.0
49	0 57.3	0 57.4	0 54.6	49	0.3	109	0.6	169	1.0
50	0 57.5	0 57.7	0 54.9	50	0.3	110	0.6	170	1.0
51	0 57.8	0 57.9	0 55.1	51	0.3	111	0.6	171	1.0
52	0 58.0	0 58.2	0 55.4	52	0.3	112	0.7	172	1.0
53	0 58.3	0 58.4	0 55.6	53	0.3	113	0.7	173	1.0
54	0 58.5	0 58.7	0 55.8	54	0.3	114	0.7	174	1.0
55	0 58.8	0 58.9	0 56.1	55	0.3	115	0.7	175	1.0
56	0 59.0	0 59.2	0 56.3	56	0.3	116	0.7	176	1.0
57	0 59.3	0 59.4	0 56.6	57	0.3	117	0.7	177	1.0
58	0 59.5	0 59.7	0 56.8	58	0.3	118	0.7	178	1.0
59	0 59.8	0 59.9	0 57.0	59	0.3	119	0.7	179	1.0
60	1 00.0	1 00.2	0 57.3	60	0.4	120	0.7	180	1.1

4m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	1 00.0	1 00.2	0 57.3	0	0.0	60	0.5	120	0.9
1	1 00.3	1 00.4	0 57.5	1	0.0	61	0.5	121	0.9
2	1 00.5	1 00.7	0 57.7	2	0.0	62	0.5	122	0.9
3	1 00.8	1 00.9	0 58.0	3	0.0	63	0.5	123	0.9
4	1 01.0	1 01.2	0 58.2	4	0.0	64	0.5	124	0.9
5	1 01.3	1 01.4	0 58.5	5	0.0	65	0.5	125	0.9
6	1 01.5	1 01.7	0 58.7	6	0.0	66	0.5	126	0.9
7	1 01.8	1 01.9	0 58.9	7	0.1	67	0.5	127	1.0
8	1 02.0	1 02.2	0 59.2	8	0.1	68	0.5	128	1.0
9	1 02.3	1 02.4	0 59.4	9	0.1	69	0.5	129	1.0
10	1 02.5	1 02.7	0 59.7	10	0.1	70	0.5	130	1.0
11	1 02.8	1 02.9	0 59.9	11	0.1	71	0.5	131	1.0
12	1 03.0	1 03.2	1 00.1	12	0.1	72	0.5	132	1.0
13	1 03.3	1 03.4	1 00.4	13	0.1	73	0.5	133	1.0
14	1 03.5	1 03.7	1 00.6	14	0.1	74	0.6	134	1.0
15	1 03.8	1 03.9	1 00.8	15	0.1	75	0.6	135	1.0
16	1 04.0	1 04.2	1 01.1	16	0.1	76	0.6	136	1.0
17	1 04.3	1 04.4	1 01.3	17	0.1	77	0.6	137	1.0
18	1 04.5	1 04.7	1 01.6	18	0.1	78	0.6	138	1.0
19	1 04.8	1 04.9	1 01.8	19	0.1	79	0.6	139	1.0
20	1 05.0	1 05.2	1 02.0	20	0.2	80	0.6	140	1.1
21	1 05.3	1 05.4	1 02.3	21	0.2	81	0.6	141	1.1
22	1 05.5	1 05.7	1 02.5	22	0.2	82	0.6	142	1.1
23	1 05.8	1 05.9	1 02.8	23	0.2	83	0.6	143	1.1
24	1 06.0	1 06.2	1 03.0	24	0.2	84	0.6	144	1.1
25	1 06.3	1 06.4	1 03.2	25	0.2	85	0.6	145	1.1
26	1 06.5	1 06.7	1 03.5	26	0.2	86	0.6	146	1.1
27	1 06.8	1 06.9	1 03.7	27	0.2	87	0.7	147	1.1
28	1 07.0	1 07.2	1 03.9	28	0.2	88	0.7	148	1.1
29	1 07.3	1 07.4	1 04.2	29	0.2	89	0.7	149	1.1
30	1 07.5	1 07.7	1 04.4	30	0.2	90	0.7	150	1.1
31	1 07.8	1 07.9	1 04.7	31	0.2	91	0.7	151	1.1
32	1 08.0	1 08.2	1 04.9	32	0.2	92	0.7	152	1.1
33	1 08.3	1 08.4	1 05.1	33	0.2	93	0.7	153	1.1
34	1 08.5	1 08.7	1 05.4	34	0.3	94	0.7	154	1.2
35	1 08.8	1 08.9	1 05.6	35	0.3	95	0.7	155	1.2
36	1 09.0	1 09.2	1 05.9	36	0.3	96	0.7	156	1.2
37	1 09.3	1 09.4	1 06.1	37	0.3	97	0.7	157	1.2
38	1 09.5	1 09.7	1 06.3	38	0.3	98	0.7	158	1.2
39	1 09.8	1 09.9	1 06.6	39	0.3	99	0.7	159	1.2
40	1 10.0	1 10.2	1 06.8	40	0.3	100	0.8	160	1.2
41	1 10.3	1 10.4	1 07.0	41	0.3	101	0.8	161	1.2
42	1 10.5	1 10.7	1 07.3	42	0.3	102	0.8	162	1.2
43	1 10.8	1 10.9	1 07.5	43	0.3	103	0.8	163	1.2
44	1 11.0	1 11.2	1 07.8	44	0.3	104	0.8	164	1.2
45	1 11.3	1 11.4	1 08.0	45	0.3	105	0.8	165	1.2
46	1 11.5	1 11.7	1 08.2	46	0.3	106	0.8	166	1.2
47	1 11.8	1 11.9	1 08.5	47	0.4	107	0.8	167	1.3
48	1 12.0	1 12.2	1 08.7	48	0.4	108	0.8	168	1.3
49	1 12.3	1 12.4	1 09.0	49	0.4	109	0.8	169	1.3
50	1 12.5	1 12.7	1 09.2	50	0.4	110	0.8	170	1.3
51	1 12.8	1 12.9	1 09.4	51	0.4	111	0.8	171	1.3
52	1 13.0	1 13.2	1 09.7	52	0.4	112	0.8	172	1.3
53	1 13.3	1 13.5	1 09.9	53	0.4	113	0.8	173	1.3
54	1 13.5	1 13.7	1 10.2	54	0.4	114	0.9	174	1.3
55	1 13.8	1 14.0	1 10.4	55	0.4	115	0.9	175	1.3
56	1 14.0	1 14.2	1 10.6	56	0.4	116	0.9	176	1.3
57	1 14.3	1 14.5	1 10.9	57	0.4	117	0.9	177	1.3
58	1 14.5	1 14.7	1 11.1	58	0.4	118	0.9	178	1.3
59	1 14.8	1 15.0	1 11.3	59	0.4	119	0.9	179	1.3
60	1 15.0	1 15.2	1 11.6	60	0.5	120	0.9	180	1.4

5m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	1 15.0	1 15.2	1 11.6	0	0.0	60	0.6	120	1.1
1	1 15.3	1 15.5	1 11.8	1	0.0	61	0.6	121	1.1
2	1 15.5	1 15.7	1 12.1	2	0.0	62	0.6	122	1.1
3	1 15.8	1 16.0	1 12.3	3	0.0	63	0.6	123	1.1
4	1 16.0	1 16.2	1 12.5	4	0.0	64	0.6	124	1.1
5	1 16.3	1 16.5	1 12.8	5	0.0	65	0.6	125	1.1
6	1 16.5	1 16.7	1 13.0	6	0.1	66	0.6	126	1.2
7	1 16.8	1 17.0	1 13.3	7	0.1	67	0.6	127	1.2
8	1 17.0	1 17.2	1 13.5	8	0.1	68	0.6	128	1.2
9	1 17.3	1 17.5	1 13.7	9	0.1	69	0.6	129	1.2
10	1 17.5	1 17.7	1 14.0	10	0.1	70	0.6	130	1.2
11	1 17.8	1 18.0	1 14.2	11	0.1	71	0.7	131	1.2
12	1 18.0	1 18.2	1 14.4	12	0.1	72	0.7	132	1.2
13	1 18.3	1 18.5	1 14.7	13	0.1	73	0.7	133	1.2
14	1 18.5	1 18.7	1 14.9	14	0.1	74	0.7	134	1.2
15	1 18.8	1 19.0	1 15.2	15	0.1	75	0.7	135	1.2
16	1 19.0	1 19.2	1 15.4	16	0.1	76	0.7	136	1.2
17	1 19.3	1 19.5	1 15.6	17	0.2	77	0.7	137	1.3
18	1 19.5	1 19.7	1 15.9	18	0.2	78	0.7	138	1.3
19	1 19.8	1 20.0	1 16.1	19	0.2	79	0.7	139	1.3
20	1 20.0	1 20.2	1 16.4	20	0.2	80	0.7	140	1.3
21	1 20.3	1 20.5	1 16.6	21	0.2	81	0.7	141	1.3
22	1 20.5	1 20.7	1 16.8	22	0.2	82	0.8	142	1.3
23	1 20.8	1 21.0	1 17.1	23	0.2	83	0.8	143	1.3
24	1 21.0	1 21.2	1 17.3	24	0.2	84	0.8	144	1.3
25	1 21.3	1 21.5	1 17.5	25	0.2	85	0.8	145	1.3
26	1 21.5	1 21.7	1 17.8	26	0.2	86	0.8	146	1.3
27	1 21.8	1 22.0	1 18.0	27	0.2	87	0.8	147	1.3
28	1 22.0	1 22.2	1 18.3	28	0.3	88	0.8	148	1.4
29	1 22.3	1 22.5	1 18.5	29	0.3	89	0.8	149	1.4
30	1 22.5	1 22.7	1 18.7	30	0.3	90	0.8	150	1.4
31	1 22.8	1 23.0	1 19.0	31	0.3	91	0.8	151	1.4
32	1 23.0	1 23.2	1 19.2	32	0.3	92	0.8	152	1.4
33	1 23.3	1 23.5	1 19.5	33	0.3	93	0.9	153	1.4
34	1 23.5	1 23.7	1 19.7	34	0.3	94	0.9	154	1.4
35	1 23.8	1 24.0	1 19.9	35	0.3	95	0.9	155	1.4
36	1 24.0	1 24.2	1 20.2	36	0.3	96	0.9	156	1.4
37	1 24.3	1 24.5	1 20.4	37	0.3	97	0.9	157	1.4
38	1 24.5	1 24.7	1 20.7	38	0.3	98	0.9	158	1.4
39	1 24.8	1 25.0	1 20.9	39	0.4	99	0.9	159	1.5
40	1 25.0	1 25.2	1 21.1	40	0.4	100	0.9	160	1.5
41	1 25.3	1 25.5	1 21.4	41	0.4	101	0.9	161	1.5
42	1 25.5	1 25.7	1 21.6	42	0.4	102	0.9	162	1.5
43	1 25.8	1 26.0	1 21.8	43	0.4	103	0.9	163	1.5
44	1 26.0	1 26.2	1 22.1	44	0.4	104	1.0	164	1.5
45	1 26.3	1 26.5	1 22.3	45	0.4	105	1.0	165	1.5
46	1 26.5	1 26.7	1 22.6	46	0.4	106	1.0	166	1.5
47	1 26.8	1 27.0	1 22.8	47	0.4	107	1.0	167	1.5
48	1 27.0	1 27.2	1 23.0	48	0.4	108	1.0	168	1.5
49	1 27.3	1 27.5	1 23.3	49	0.4	109	1.0	169	1.5
50	1 27.5	1 27.7	1 23.5	50	0.5	110	1.0	170	1.6
51	1 27.8	1 28.0	1 23.8	51	0.5	111	1.0	171	1.6
52	1 28.0	1 28.2	1 24.0	52	0.5	112	1.0	172	1.6
53	1 28.3	1 28.5	1 24.2	53	0.5	113	1.0	173	1.6
54	1 28.5	1 28.7	1 24.5	54	0.5	114	1.0	174	1.6
55	1 28.8	1 29.0	1 24.7	55	0.5	115	1.1	175	1.6
56	1 29.0	1 29.2	1 24.9	56	0.5	116	1.1	176	1.6
57	1 29.3	1 29.5	1 25.2	57	0.5	117	1.1	177	1.6
58	1 29.5	1 29.7	1 25.4	58	0.5	118	1.1	178	1.6
59	1 29.8	1 30.0	1 25.7	59	0.5	119	1.1	179	1.6
60	1 30.0	1 30.2	1 25.9	60	0.6	120	1.1	180	1.7

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	1 30.0	1 30.2	1 25.9	0	0.0	60	0.7	120	1.3
1	1 30.3	1 30.5	1 26.1	1	0.0	61	0.7	121	1.3
2	1 30.5	1 30.7	1 26.4	2	0.0	62	0.7	122	1.3
3	1 30.8	1 31.0	1 26.6	3	0.0	63	0.7	123	1.3
4	1 31.0	1 31.2	1 26.9	4	0.0	64	0.7	124	1.3
5	1 31.3	1 31.5	1 27.1	5	0.1	65	0.7	125	1.4
6	1 31.5	1 31.8	1 27.3	6	0.1	66	0.7	126	1.4
7	1 31.8	1 32.0	1 27.6	7	0.1	67	0.7	127	1.4
8	1 32.0	1 32.3	1 27.8	8	0.1	68	0.7	128	1.4
9	1 32.3	1 32.5	1 28.0	9	0.1	69	0.7	129	1.4
10	1 32.5	1 32.8	1 28.3	10	0.1	70	0.8	130	1.4
11	1 32.8	1 33.0	1 28.5	11	0.1	71	0.8	131	1.4
12	1 33.0	1 33.3	1 28.8	12	0.1	72	0.8	132	1.4
13	1 33.3	1 33.5	1 29.0	13	0.1	73	0.8	133	1.4
14	1 33.5	1 33.8	1 29.2	14	0.2	74	0.8	134	1.5
15	1 33.8	1 34.0	1 29.5	15	0.2	75	0.8	135	1.5
16	1 34.0	1 34.3	1 29.7	16	0.2	76	0.8	136	1.5
17	1 34.3	1 34.5	1 30.0	17	0.2	77	0.8	137	1.5
18	1 34.5	1 34.8	1 30.2	18	0.2	78	0.8	138	1.5
19	1 34.8	1 35.0	1 30.4	19	0.2	79	0.9	139	1.5
20	1 35.0	1 35.3	1 30.7	20	0.2	80	0.9	140	1.5
21	1 35.3	1 35.5	1 30.9	21	0.2	81	0.9	141	1.5
22	1 35.5	1 35.8	1 31.1	22	0.2	82	0.9	142	1.5
23	1 35.8	1 36.0	1 31.4	23	0.2	83	0.9	143	1.5
24	1 36.0	1 36.3	1 31.6	24	0.3	84	0.9	144	1.6
25	1 36.3	1 36.5	1 31.9	25	0.3	85	0.9	145	1.6
26	1 36.5	1 36.8	1 32.1	26	0.3	86	0.9	146	1.6
27	1 36.8	1 37.0	1 32.3	27	0.3	87	0.9	147	1.6
28	1 37.0	1 37.3	1 32.6	28	0.3	88	1.0	148	1.6
29	1 37.3	1 37.5	1 32.8	29	0.3	89	1.0	149	1.6
30	1 37.5	1 37.8	1 33.1	30	0.3	90	1.0	150	1.6
31	1 37.8	1 38.0	1 33.3	31	0.3	91	1.0	151	1.6
32	1 38.0	1 38.3	1 33.5	32	0.3	92	1.0	152	1.6
33	1 38.3	1 38.5	1 33.8	33	0.4	93	1.0	153	1.7
34	1 38.5	1 38.8	1 34.0	34	0.4	94	1.0	154	1.7
35	1 38.8	1 39.0	1 34.3	35	0.4	95	1.0	155	1.7
36	1 39.0	1 39.3	1 34.5	36	0.4	96	1.0	156	1.7
37	1 39.3	1 39.5	1 34.7	37	0.4	97	1.1	157	1.7
38	1 39.5	1 39.8	1 35.0	38	0.4	98	1.1	158	1.7
39	1 39.8	1 40.0	1 35.2	39	0.4	99	1.1	159	1.7
40	1 40.0	1 40.3	1 35.4	40	0.4	100	1.1	160	1.7
41	1 40.3	1 40.5	1 35.7	41	0.4	101	1.1	161	1.7
42	1 40.5	1 40.8	1 35.9	42	0.5	102	1.1	162	1.8
43	1 40.8	1 41.0	1 36.2	43	0.5	103	1.1	163	1.8
44	1 41.0	1 41.3	1 36.4	44	0.5	104	1.1	164	1.8
45	1 41.3	1 41.5	1 36.6	45	0.5	105	1.1	165	1.8
46	1 41.5	1 41.8	1 36.9	46	0.5	106	1.1	166	1.8
47	1 41.8	1 42.0	1 37.1	47	0.5	107	1.2	167	1.8
48	1 42.0	1 42.3	1 37.4	48	0.5	108	1.2	168	1.8
49	1 42.3	1 42.5	1 37.6	49	0.5	109	1.2	169	1.8
50	1 42.5	1 42.8	1 37.8	50	0.5	110	1.2	170	1.8
51	1 42.8	1 43.0	1 38.1	51	0.6	111	1.2	171	1.9
52	1 43.0	1 43.3	1 38.3	52	0.6	112	1.2	172	1.9
53	1 43.3	1 43.5	1 38.5	53	0.6	113	1.2	173	1.9
54	1 43.5	1 43.8	1 38.8	54	0.6	114	1.2	174	1.9
55	1 43.8	1 44.0	1 39.0	55	0.6	115	1.2	175	1.9
56	1 44.0	1 44.3	1 39.3	56	0.6	116	1.3	176	1.9
57	1 44.3	1 44.5	1 39.5	57	0.6	117	1.3	177	1.9
58	1 44.5	1 44.8	1 39.7	58	0.6	118	1.3	178	1.9
59	1 44.8	1 45.0	1 40.0	59	0.6	119	1.3	179	1.9
60	1 45.0	1 45.3	1 40.2	60	0.7	120	1.3	180	2.0

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	1 45.0	1 45.3	1 40.2	0	0.0	60	0.8	120	1.5
1	1 45.3	1 45.5	1 40.5	1	0.0	61	0.8	121	1.5
2	1 45.5	1 45.8	1 40.7	2	0.0	62	0.8	122	1.5
3	1 45.8	1 46.0	1 40.9	3	0.0	63	0.8	123	1.5
4	1 46.0	1 46.3	1 41.2	4	0.1	64	0.8	124	1.6
5	1 46.3	1 46.5	1 41.4	5	0.1	65	0.8	125	1.6
6	1 46.5	1 46.8	1 41.6	6	0.1	66	0.8	126	1.6
7	1 46.8	1 47.0	1 41.9	7	0.1	67	0.8	127	1.6
8	1 47.0	1 47.3	1 42.1	8	0.1	68	0.9	128	1.6
9	1 47.3	1 47.5	1 42.4	9	0.1	69	0.9	129	1.6
10	1 47.5	1 47.8	1 42.6	10	0.1	70	0.9	130	1.6
11	1 47.8	1 48.0	1 42.8	11	0.1	71	0.9	131	1.6
12	1 48.0	1 48.3	1 43.1	12	0.2	72	0.9	132	1.7
13	1 48.3	1 48.5	1 43.3	13	0.2	73	0.9	133	1.7
14	1 48.5	1 48.8	1 43.6	14	0.2	74	0.9	134	1.7
15	1 48.8	1 49.0	1 43.8	15	0.2	75	0.9	135	1.7
16	1 49.0	1 49.3	1 44.0	16	0.2	76	1.0	136	1.7
17	1 49.3	1 49.5	1 44.3	17	0.2	77	1.0	137	1.7
18	1 49.5	1 49.8	1 44.5	18	0.2	78	1.0	138	1.7
19	1 49.8	1 50.1	1 44.8	19	0.2	79	1.0	139	1.7
20	1 50.0	1 50.3	1 45.0	20	0.3	80	1.0	140	1.8
21	1 50.3	1 50.6	1 45.2	21	0.3	81	1.0	141	1.8
22	1 50.5	1 50.8	1 45.5	22	0.3	82	1.0	142	1.8
23	1 50.8	1 51.1	1 45.7	23	0.3	83	1.0	143	1.8
24	1 51.0	1 51.3	1 45.9	24	0.3	84	1.1	144	1.8
25	1 51.3	1 51.6	1 46.2	25	0.3	85	1.1	145	1.8
26	1 51.5	1 51.8	1 46.4	26	0.3	86	1.1	146	1.8
27	1 51.8	1 52.1	1 46.7	27	0.3	87	1.1	147	1.8
28	1 52.0	1 52.3	1 46.9	28	0.4	88	1.1	148	1.9
29	1 52.3	1 52.6	1 47.1	29	0.4	89	1.1	149	1.9
30	1 52.5	1 52.8	1 47.4	30	0.4	90	1.1	150	1.9
31	1 52.8	1 53.1	1 47.6	31	0.4	91	1.1	151	1.9
32	1 53.0	1 53.3	1 47.9	32	0.4	92	1.2	152	1.9
33	1 53.3	1 53.6	1 48.1	33	0.4	93	1.2	153	1.9
34	1 53.5	1 53.8	1 48.3	34	0.4	94	1.2	154	1.9
35	1 53.8	1 54.1	1 48.6	35	0.4	95	1.2	155	1.9
36	1 54.0	1 54.3	1 48.8	36	0.5	96	1.2	156	2.0
37	1 54.3	1 54.6	1 49.0	37	0.5	97	1.2	157	2.0
38	1 54.5	1 54.8	1 49.3	38	0.5	98	1.2	158	2.0
39	1 54.8	1 55.1	1 49.5	39	0.5	99	1.2	159	2.0
40	1 55.0	1 55.3	1 49.8	40	0.5	100	1.3	160	2.0
41	1 55.3	1 55.6	1 50.0	41	0.5	101	1.3	161	2.0
42	1 55.5	1 55.8	1 50.2	42	0.5	102	1.3	162	2.0
43	1 55.8	1 56.1	1 50.5	43	0.5	103	1.3	163	2.0
44	1 56.0	1 56.3	1 50.7	44	0.6	104	1.3	164	2.1
45	1 56.3	1 56.6	1 51.0	45	0.6	105	1.3	165	2.1
46	1 56.5	1 56.8	1 51.2	46	0.6	106	1.3	166	2.1
47	1 56.8	1 57.1	1 51.4	47	0.6	107	1.3	167	2.1
48	1 57.0	1 57.3	1 51.7	48	0.6	108	1.4	168	2.1
49	1 57.3	1 57.6	1 51.9	49	0.6	109	1.4	169	2.1
50	1 57.5	1 57.8	1 52.1	50	0.6	110	1.4	170	2.1
51	1 57.8	1 58.1	1 52.4	51	0.6	111	1.4	171	2.1
52	1 58.0	1 58.3	1 52.6	52	0.7	112	1.4	172	2.2
53	1 58.3	1 58.6	1 52.9	53	0.7	113	1.4	173	2.2
54	1 58.5	1 58.8	1 53.1	54	0.7	114	1.4	174	2.2
55	1 58.8	1 59.1	1 53.3	55	0.7	115	1.4	175	2.2
56	1 59.0	1 59.3	1 53.6	56	0.7	116	1.5	176	2.2
57	1 59.3	1 59.6	1 53.8	57	0.7	117	1.5	177	2.2
58	1 59.5	1 59.8	1 54.1	58	0.7	118	1.5	178	2.2
59	1 59.8	2 00.1	1 54.3	59	0.7	119	1.5	179	2.2
60	2 00.0	2 00.3	1 54.5	60	0.8	120	1.5	180	2.3

8m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	2 00.0	2 00.3	1 54.5	0	0.0	60	0.9	120	1.7
1	2 00.3	2 00.6	1 54.8	1	0.0	61	0.9	121	1.7
2	2 00.5	2 00.8	1 55.0	2	0.0	62	0.9	122	1.7
3	2 00.8	2 01.1	1 55.2	3	0.0	63	0.9	123	1.7
4	2 01.0	2 01.3	1 55.5	4	0.1	64	0.9	124	1.8
5	2 01.3	2 01.6	1 55.7	5	0.1	65	0.9	125	1.8
6	2 01.5	2 01.8	1 56.0	6	0.1	66	0.9	126	1.8
7	2 01.8	2 02.1	1 56.2	7	0.1	67	0.9	127	1.8
8	2 02.0	2 02.3	1 56.4	8	0.1	68	1.0	128	1.8
9	2 02.3	2 02.6	1 56.7	9	0.1	69	1.0	129	1.8
10	2 02.5	2 02.8	1 56.9	10	0.1	70	1.0	130	1.8
11	2 02.8	2 03.1	1 57.2	11	0.2	71	1.0	131	1.9
12	2 03.0	2 03.3	1 57.4	12	0.2	72	1.0	132	1.9
13	2 03.3	2 03.6	1 57.6	13	0.2	73	1.0	133	1.9
14	2 03.5	2 03.8	1 57.9	14	0.2	74	1.0	134	1.9
15	2 03.8	2 04.1	1 58.1	15	0.2	75	1.1	135	1.9
16	2 04.0	2 04.3	1 58.4	16	0.2	76	1.1	136	1.9
17	2 04.3	2 04.6	1 58.6	17	0.2	77	1.1	137	1.9
18	2 04.5	2 04.8	1 58.8	18	0.3	78	1.1	138	2.0
19	2 04.8	2 05.1	1 59.1	19	0.3	79	1.1	139	2.0
20	2 05.0	2 05.3	1 59.3	20	0.3	80	1.1	140	2.0
21	2 05.3	2 05.6	1 59.5	21	0.3	81	1.1	141	2.0
22	2 05.5	2 05.8	1 59.8	22	0.3	82	1.2	142	2.0
23	2 05.8	2 06.1	2 00.0	23	0.3	83	1.2	143	2.0
24	2 06.0	2 06.3	2 00.3	24	0.3	84	1.2	144	2.0
25	2 06.3	2 06.6	2 00.5	25	0.4	85	1.2	145	2.1
26	2 06.5	2 06.8	2 00.7	26	0.4	86	1.2	146	2.1
27	2 06.8	2 07.1	2 01.0	27	0.4	87	1.2	147	2.1
28	2 07.0	2 07.3	2 01.2	28	0.4	88	1.2	148	2.1
29	2 07.3	2 07.6	2 01.5	29	0.4	89	1.3	149	2.1
30	2 07.5	2 07.8	2 01.7	30	0.4	90	1.3	150	2.1
31	2 07.8	2 08.1	2 01.9	31	0.4	91	1.3	151	2.1
32	2 08.0	2 08.4	2 02.2	32	0.5	92	1.3	152	2.2
33	2 08.3	2 08.6	2 02.4	33	0.5	93	1.3	153	2.2
34	2 08.5	2 08.9	2 02.6	34	0.5	94	1.3	154	2.2
35	2 08.8	2 09.1	2 02.9	35	0.5	95	1.3	155	2.2
36	2 09.0	2 09.4	2 03.1	36	0.5	96	1.4	156	2.2
37	2 09.3	2 09.6	2 03.4	37	0.5	97	1.4	157	2.2
38	2 09.5	2 09.9	2 03.6	38	0.5	98	1.4	158	2.2
39	2 09.8	2 10.1	2 03.8	39	0.6	99	1.4	159	2.3
40	2 10.0	2 10.4	2 04.1	40	0.6	100	1.4	160	2.3
41	2 10.3	2 10.6	2 04.3	41	0.6	101	1.4	161	2.3
42	2 10.5	2 10.9	2 04.6	42	0.6	102	1.4	162	2.3
43	2 10.8	2 11.1	2 04.8	43	0.6	103	1.5	163	2.3
44	2 11.0	2 11.4	2 05.0	44	0.6	104	1.5	164	2.3
45	2 11.3	2 11.6	2 05.3	45	0.6	105	1.5	165	2.3
46	2 11.5	2 11.9	2 05.5	46	0.7	106	1.5	166	2.4
47	2 11.8	2 12.1	2 05.7	47	0.7	107	1.5	167	2.4
48	2 12.0	2 12.4	2 06.0	48	0.7	108	1.5	168	2.4
49	2 12.3	2 12.6	2 06.2	49	0.7	109	1.5	169	2.4
50	2 12.5	2 12.9	2 06.5	50	0.7	110	1.6	170	2.4
51	2 12.8	2 13.1	2 06.7	51	0.7	111	1.6	171	2.4
52	2 13.0	2 13.4	2 06.9	52	0.7	112	1.6	172	2.4
53	2 13.3	2 13.6	2 07.2	53	0.8	113	1.6	173	2.5
54	2 13.5	2 13.9	2 07.4	54	0.8	114	1.6	174	2.5
55	2 13.8	2 14.1	2 07.7	55	0.8	115	1.6	175	2.5
56	2 14.0	2 14.4	2 07.9	56	0.8	116	1.6	176	2.5
57	2 14.3	2 14.6	2 08.1	57	0.8	117	1.7	177	2.5
58	2 14.5	2 14.9	2 08.4	58	0.8	118	1.7	178	2.5
59	2 14.8	2 15.1	2 08.6	59	0.8	119	1.7	179	2.5
60	2 15.0	2 15.4	2 08.9	60	0.9	120	1.7	180	2.6

9m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	2 15.0	2 15.4	2 08.9	0	0.0	60	1.0	120	1.9
1	2 15.3	2 15.6	2 09.1	1	0.0	61	1.0	121	1.9
2	2 15.5	2 15.9	2 09.3	2	0.0	62	1.0	122	1.9
3	2 15.8	2 16.1	2 09.6	3	0.0	63	1.0	123	1.9
4	2 16.0	2 16.4	2 09.8	4	0.1	64	1.0	124	2.0
5	2 16.3	2 16.6	2 10.0	5	0.1	65	1.0	125	2.0
6	2 16.5	2 16.9	2 10.3	6	0.1	66	1.0	126	2.0
7	2 16.8	2 17.1	2 10.5	7	0.1	67	1.1	127	2.0
8	2 17.0	2 17.4	2 10.8	8	0.1	68	1.1	128	2.0
9	2 17.3	2 17.6	2 11.0	9	0.1	69	1.1	129	2.0
10	2 17.5	2 17.9	2 11.2	10	0.2	70	1.1	130	2.1
11	2 17.8	2 18.1	2 11.5	11	0.2	71	1.1	131	2.1
12	2 18.0	2 18.4	2 11.7	12	0.2	72	1.1	132	2.1
13	2 18.3	2 18.6	2 12.0	13	0.2	73	1.2	133	2.1
14	2 18.5	2 18.9	2 12.2	14	0.2	74	1.2	134	2.1
15	2 18.8	2 19.1	2 12.4	15	0.2	75	1.2	135	2.1
16	2 19.0	2 19.4	2 12.7	16	0.3	76	1.2	136	2.2
17	2 19.3	2 19.6	2 12.9	17	0.3	77	1.2	137	2.2
18	2 19.5	2 19.9	2 13.1	18	0.3	78	1.2	138	2.2
19	2 19.8	2 20.1	2 13.4	19	0.3	79	1.3	139	2.2
20	2 20.0	2 20.4	2 13.6	20	0.3	80	1.3	140	2.2
21	2 20.3	2 20.6	2 13.9	21	0.3	81	1.3	141	2.2
22	2 20.5	2 20.9	2 14.1	22	0.3	82	1.3	142	2.2
23	2 20.8	2 21.1	2 14.3	23	0.4	83	1.3	143	2.3
24	2 21.0	2 21.4	2 14.6	24	0.4	84	1.3	144	2.3
25	2 21.3	2 21.6	2 14.8	25	0.4	85	1.3	145	2.3
26	2 21.5	2 21.9	2 15.1	26	0.4	86	1.4	146	2.3
27	2 21.8	2 22.1	2 15.3	27	0.4	87	1.4	147	2.3
28	2 22.0	2 22.4	2 15.5	28	0.4	88	1.4	148	2.3
29	2 22.3	2 22.6	2 15.8	29	0.5	89	1.4	149	2.4
30	2 22.5	2 22.9	2 16.0	30	0.5	90	1.4	150	2.4
31	2 22.8	2 23.1	2 16.2	31	0.5	91	1.4	151	2.4
32	2 23.0	2 23.4	2 16.5	32	0.5	92	1.5	152	2.4
33	2 23.3	2 23.6	2 16.7	33	0.5	93	1.5	153	2.4
34	2 23.5	2 23.9	2 17.0	34	0.5	94	1.5	154	2.4
35	2 23.8	2 24.1	2 17.2	35	0.6	95	1.5	155	2.5
36	2 24.0	2 24.4	2 17.4	36	0.6	96	1.5	156	2.5
37	2 24.3	2 24.6	2 17.7	37	0.6	97	1.5	157	2.5
38	2 24.5	2 24.9	2 17.9	38	0.6	98	1.6	158	2.5
39	2 24.8	2 25.1	2 18.2	39	0.6	99	1.6	159	2.5
40	2 25.0	2 25.4	2 18.4	40	0.6	100	1.6	160	2.5
41	2 25.3	2 25.6	2 18.6	41	0.6	101	1.6	161	2.5
42	2 25.5	2 25.9	2 18.9	42	0.7	102	1.6	162	2.6
43	2 25.8	2 26.1	2 19.1	43	0.7	103	1.6	163	2.6
44	2 26.0	2 26.4	2 19.3	44	0.7	104	1.6	164	2.6
45	2 26.3	2 26.7	2 19.6	45	0.7	105	1.7	165	2.6
46	2 26.5	2 26.9	2 19.8	46	0.7	106	1.7	166	2.6
47	2 26.8	2 27.2	2 20.1	47	0.7	107	1.7	167	2.6
48	2 27.0	2 27.4	2 20.3	48	0.8	108	1.7	168	2.7
49	2 27.3	2 27.7	2 20.5	49	0.8	109	1.7	169	2.7
50	2 27.5	2 27.9	2 20.8	50	0.8	110	1.7	170	2.7
51	2 27.8	2 28.2	2 21.0	51	0.8	111	1.8	171	2.7
52	2 28.0	2 28.4	2 21.3	52	0.8	112	1.8	172	2.7
53	2 28.3	2 28.7	2 21.5	53	0.8	113	1.8	173	2.7
54	2 28.5	2 28.9	2 21.7	54	0.9	114	1.8	174	2.8
55	2 28.8	2 29.2	2 22.0	55	0.9	115	1.8	175	2.8
56	2 29.0	2 29.4	2 22.2	56	0.9	116	1.8	176	2.8
57	2 29.3	2 29.7	2 22.5	57	0.9	117	1.9	177	2.8
58	2 29.5	2 29.9	2 22.7	58	0.9	118	1.9	178	2.8
59	2 29.8	2 30.2	2 22.9	59	0.9	119	1.9	179	2.8
60	2 30.0	2 30.4	2 23.2	60	1.0	120	1.9	180	2.9

10^m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	2 30.0	2 30.4	2 23.2	0	0.0	60	1.1	120	2.1
1	2 30.3	2 30.7	2 23.4	1	0.0	61	1.1	121	2.1
2	2 30.5	2 30.9	2 23.6	2	0.0	62	1.1	122	2.1
3	2 30.8	2 31.2	2 23.9	3	0.1	63	1.1	123	2.2
4	2 31.0	2 31.4	2 24.1	4	0.1	64	1.1	124	2.2
5	2 31.3	2 31.7	2 24.4	5	0.1	65	1.1	125	2.2
6	2 31.5	2 31.9	2 24.6	6	0.1	66	1.2	126	2.2
7	2 31.8	2 32.2	2 24.8	7	0.1	67	1.2	127	2.2
8	2 32.0	2 32.4	2 25.1	8	0.1	68	1.2	128	2.2
9	2 32.3	2 32.7	2 25.3	9	0.2	69	1.2	129	2.3
10	2 32.5	2 32.9	2 25.6	10	0.2	70	1.2	130	2.3
11	2 32.8	2 33.2	2 25.8	11	0.2	71	1.2	131	2.3
12	2 33.0	2 33.4	2 26.0	12	0.2	72	1.3	132	2.3
13	2 33.3	2 33.7	2 26.3	13	0.2	73	1.3	133	2.3
14	2 33.5	2 33.9	2 26.5	14	0.2	74	1.3	134	2.3
15	2 33.8	2 34.2	2 26.7	15	0.3	75	1.3	135	2.4
16	2 34.0	2 34.4	2 27.0	16	0.3	76	1.3	136	2.4
17	2 34.3	2 34.7	2 27.2	17	0.3	77	1.3	137	2.4
18	2 34.5	2 34.9	2 27.5	18	0.3	78	1.4	138	2.4
19	2 34.8	2 35.2	2 27.7	19	0.3	79	1.4	139	2.4
20	2 35.0	2 35.4	2 27.9	20	0.4	80	1.4	140	2.5
21	2 35.3	2 35.7	2 28.2	21	0.4	81	1.4	141	2.5
22	2 35.5	2 35.9	2 28.4	22	0.4	82	1.4	142	2.5
23	2 35.8	2 36.2	2 28.7	23	0.4	83	1.5	143	2.5
24	2 36.0	2 36.4	2 28.9	24	0.4	84	1.5	144	2.5
25	2 36.3	2 36.7	2 29.1	25	0.4	85	1.5	145	2.5
26	2 36.5	2 36.9	2 29.4	26	0.5	86	1.5	146	2.6
27	2 36.8	2 37.2	2 29.6	27	0.5	87	1.5	147	2.6
28	2 37.0	2 37.4	2 29.8	28	0.5	88	1.5	148	2.6
29	2 37.3	2 37.7	2 30.1	29	0.5	89	1.6	149	2.6
30	2 37.5	2 37.9	2 30.3	30	0.5	90	1.6	150	2.6
31	2 37.8	2 38.2	2 30.6	31	0.5	91	1.6	151	2.6
32	2 38.0	2 38.4	2 30.8	32	0.6	92	1.6	152	2.7
33	2 38.3	2 38.7	2 31.0	33	0.6	93	1.6	153	2.7
34	2 38.5	2 38.9	2 31.3	34	0.6	94	1.6	154	2.7
35	2 38.8	2 39.2	2 31.5	35	0.6	95	1.7	155	2.7
36	2 39.0	2 39.4	2 31.8	36	0.6	96	1.7	156	2.7
37	2 39.3	2 39.7	2 32.0	37	0.6	97	1.7	157	2.7
38	2 39.5	2 39.9	2 32.2	38	0.7	98	1.7	158	2.8
39	2 39.8	2 40.2	2 32.5	39	0.7	99	1.7	159	2.8
40	2 40.0	2 40.4	2 32.7	40	0.7	100	1.8	160	2.8
41	2 40.3	2 40.7	2 32.9	41	0.7	101	1.8	161	2.8
42	2 40.5	2 40.9	2 33.2	42	0.7	102	1.8	162	2.8
43	2 40.8	2 41.2	2 33.4	43	0.8	103	1.8	163	2.9
44	2 41.0	2 41.4	2 33.7	44	0.8	104	1.8	164	2.9
45	2 41.3	2 41.7	2 33.9	45	0.8	105	1.8	165	2.9
46	2 41.5	2 41.9	2 34.1	46	0.8	106	1.9	166	2.9
47	2 41.8	2 42.2	2 34.4	47	0.8	107	1.9	167	2.9
48	2 42.0	2 42.4	2 34.6	48	0.8	108	1.9	168	2.9
49	2 42.3	2 42.7	2 34.9	49	0.9	109	1.9	169	3.0
50	2 42.5	2 42.9	2 35.1	50	0.9	110	1.9	170	3.0
51	2 42.8	2 43.2	2 35.3	51	0.9	111	1.9	171	3.0
52	2 43.0	2 43.4	2 35.6	52	0.9	112	2.0	172	3.0
53	2 43.3	2 43.7	2 35.8	53	0.9	113	2.0	173	3.0
54	2 43.5	2 43.9	2 36.1	54	0.9	114	2.0	174	3.0
55	2 43.8	2 44.2	2 36.3	55	1.0	115	2.0	175	3.1
56	2 44.0	2 44.4	2 36.5	56	1.0	116	2.0	176	3.1
57	2 44.3	2 44.7	2 36.8	57	1.0	117	2.0	177	3.1
58	2 44.5	2 45.0	2 37.0	58	1.0	118	2.1	178	3.1
59	2 44.8	2 45.2	2 37.2	59	1.0	119	2.1	179	3.1
60	2 45.0	2 45.5	2 37.5	60	1.1	120	2.1	180	3.2

11^m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	2 45.0	2 45.5	2 37.5	0	0.0	60	1.2	120	2.3
1	2 45.3	2 45.7	2 37.7	1	0.0	61	1.2	121	2.3
2	2 45.5	2 46.0	2 38.0	2	0.0	62	1.2	122	2.3
3	2 45.8	2 46.2	2 38.2	3	0.1	63	1.2	123	2.4
4	2 46.0	2 46.5	2 38.4	4	0.1	64	1.2	124	2.4
5	2 46.3	2 46.7	2 38.7	5	0.1	65	1.2	125	2.4
6	2 46.5	2 47.0	2 38.9	6	0.1	66	1.3	126	2.4
7	2 46.8	2 47.2	2 39.2	7	0.1	67	1.3	127	2.4
8	2 47.0	2 47.5	2 39.4	8	0.2	68	1.3	128	2.5
9	2 47.3	2 47.7	2 39.6	9	0.2	69	1.3	129	2.5
10	2 47.5	2 48.0	2 39.9	10	0.2	70	1.3	130	2.5
11	2 47.8	2 48.2	2 40.1	11	0.2	71	1.4	131	2.5
12	2 48.0	2 48.5	2 40.3	12	0.2	72	1.4	132	2.5
13	2 48.3	2 48.7	2 40.6	13	0.2	73	1.4	133	2.5
14	2 48.5	2 49.0	2 40.8	14	0.3	74	1.4	134	2.6
15	2 48.8	2 49.2	2 41.1	15	0.3	75	1.4	135	2.6
16	2 49.0	2 49.5	2 41.3	16	0.3	76	1.5	136	2.6
17	2 49.3	2 49.7	2 41.5	17	0.3	77	1.5	137	2.6
18	2 49.5	2 50.0	2 41.8	18	0.3	78	1.5	138	2.6
19	2 49.8	2 50.2	2 42.0	19	0.4	79	1.5	139	2.7
20	2 50.0	2 50.5	2 42.3	20	0.4	80	1.5	140	2.7
21	2 50.3	2 50.7	2 42.5	21	0.4	81	1.6	141	2.7
22	2 50.5	2 51.0	2 42.7	22	0.4	82	1.6	142	2.7
23	2 50.8	2 51.2	2 43.0	23	0.4	83	1.6	143	2.7
24	2 51.0	2 51.5	2 43.2	24	0.5	84	1.6	144	2.8
25	2 51.3	2 51.7	2 43.4	25	0.5	85	1.6	145	2.8
26	2 51.5	2 52.0	2 43.7	26	0.5	86	1.6	146	2.8
27	2 51.8	2 52.2	2 43.9	27	0.5	87	1.7	147	2.8
28	2 52.0	2 52.5	2 44.2	28	0.5	88	1.7	148	2.8
29	2 52.3	2 52.7	2 44.4	29	0.6	89	1.7	149	2.9
30	2 52.5	2 53.0	2 44.6	30	0.6	90	1.7	150	2.9
31	2 52.8	2 53.2	2 44.9	31	0.6	91	1.7	151	2.9
32	2 53.0	2 53.5	2 45.1	32	0.6	92	1.8	152	2.9
33	2 53.3	2 53.7	2 45.4	33	0.6	93	1.8	153	2.9
34	2 53.5	2 54.0	2 45.6	34	0.7	94	1.8	154	3.0
35	2 53.8	2 54.2	2 45.8	35	0.7	95	1.8	155	3.0
36	2 54.0	2 54.5	2 46.1	36	0.7	96	1.8	156	3.0
37	2 54.3	2 54.7	2 46.3	37	0.7	97	1.9	157	3.0
38	2 54.5	2 55.0	2 46.6	38	0.7	98	1.9	158	3.0
39	2 54.8	2 55.2	2 46.8	39	0.7	99	1.9	159	3.0
40	2 55.0	2 55.5	2 47.0	40	0.8	100	1.9	160	3.1
41	2 55.3	2 55.7	2 47.3	41	0.8	101	1.9	161	3.1
42	2 55.5	2 56.0	2 47.5	42	0.8	102	2.0	162	3.1
43	2 55.8	2 56.2	2 47.7	43	0.8	103	2.0	163	3.1
44	2 56.0	2 56.5	2 48.0	44	0.8	104	2.0	164	3.1
45	2 56.3	2 56.7	2 48.2	45	0.9	105	2.0	165	3.2
46	2 56.5	2 57.0	2 48.5	46	0.9	106	2.0	166	3.2
47	2 56.8	2 57.2	2 48.7	47	0.9	107	2.1	167	3.2
48	2 57.0	2 57.5	2 48.9	48	0.9	108	2.1	168	3.2
49	2 57.3	2 57.7	2 49.2	49	0.9	109	2.1	169	3.2
50	2 57.5	2 58.0	2 49.4	50	1.0	110	2.1	170	3.3
51	2 57.8	2 58.2	2 49.7	51	1.0	111	2.1	171	3.3
52	2 58.0	2 58.5	2 49.9	52	1.0	112	2.1	172	3.3
53	2 58.3	2 58.7	2 50.1	53	1.0	113	2.2	173	3.3
54	2 58.5	2 59.0	2 50.4	54	1.0	114	2.2	174	3.3
55	2 58.8	2 59.2	2 50.6	55	1.1	115	2.2	175	3.4
56	2 59.0	2 59.5	2 50.8	56	1.1	116	2.2	176	3.4
57	2 59.3	2 59.7	2 51.1	57	1.1	117	2.2	177	3.4
58	2 59.5	3 00.0	2 51.3	58	1.1	118	2.3	178	3.4
59	2 59.8	3 00.2	2 51.6	59	1.1	119	2.3	179	3.4
60	3 00.0	3 00.5	2 51.8	60	1.2	120	2.3	180	3.5

12m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	3 00.0	3 00.5	2 51.8	0	0.0	60	1.3	120	2.5
1	3 00.3	3 00.7	2 52.0	1	0.0	61	1.3	121	2.5
2	3 00.5	3 01.0	2 52.3	2	0.0	62	1.3	122	2.5
3	3 00.8	3 01.2	2 52.5	3	0.1	63	1.3	123	2.6
4	3 01.0	3 01.5	2 52.8	4	0.1	64	1.3	124	2.6
5	3 01.3	3 01.7	2 53.0	5	0.1	65	1.4	125	2.6
6	3 01.5	3 02.0	2 53.2	6	0.1	66	1.4	126	2.6
7	3 01.8	3 02.2	2 53.5	7	0.1	67	1.4	127	2.6
8	3 02.0	3 02.5	2 53.7	8	0.2	68	1.4	128	2.7
9	3 02.3	3 02.7	2 53.9	9	0.2	69	1.4	129	2.7
10	3 02.5	3 03.0	2 54.2	10	0.2	70	1.5	130	2.7
11	3 02.8	3 03.3	2 54.4	11	0.2	71	1.5	131	2.7
12	3 03.0	3 03.5	2 54.7	12	0.3	72	1.5	132	2.8
13	3 03.3	3 03.8	2 54.9	13	0.3	73	1.5	133	2.8
14	3 03.5	3 04.0	2 55.1	14	0.3	74	1.5	134	2.8
15	3 03.8	3 04.3	2 55.4	15	0.3	75	1.6	135	2.8
16	3 04.0	3 04.5	2 55.6	16	0.3	76	1.6	136	2.8
17	3 04.3	3 04.8	2 55.9	17	0.4	77	1.6	137	2.9
18	3 04.5	3 05.0	2 56.1	18	0.4	78	1.6	138	2.9
19	3 04.8	3 05.3	2 56.3	19	0.4	79	1.6	139	2.9
20	3 05.0	3 05.5	2 56.6	20	0.4	80	1.7	140	2.9
21	3 05.3	3 05.8	2 56.8	21	0.4	81	1.7	141	2.9
22	3 05.5	3 06.0	2 57.0	22	0.5	82	1.7	142	3.0
23	3 05.8	3 06.3	2 57.3	23	0.5	83	1.7	143	3.0
24	3 06.0	3 06.5	2 57.5	24	0.5	84	1.8	144	3.0
25	3 06.3	3 06.8	2 57.8	25	0.5	85	1.8	145	3.0
26	3 06.5	3 07.0	2 58.0	26	0.5	86	1.8	146	3.0
27	3 06.8	3 07.3	2 58.2	27	0.6	87	1.8	147	3.1
28	3 07.0	3 07.5	2 58.5	28	0.6	88	1.8	148	3.1
29	3 07.3	3 07.8	2 58.7	29	0.6	89	1.9	149	3.1
30	3 07.5	3 08.0	2 59.0	30	0.6	90	1.9	150	3.1
31	3 07.8	3 08.3	2 59.2	31	0.6	91	1.9	151	3.1
32	3 08.0	3 08.5	2 59.4	32	0.7	92	1.9	152	3.2
33	3 08.3	3 08.8	2 59.7	33	0.7	93	1.9	153	3.2
34	3 08.5	3 09.0	2 59.9	34	0.7	94	2.0	154	3.2
35	3 08.8	3 09.3	3 00.2	35	0.7	95	2.0	155	3.2
36	3 09.0	3 09.5	3 00.4	36	0.8	96	2.0	156	3.3
37	3 09.3	3 09.8	3 00.6	37	0.8	97	2.0	157	3.3
38	3 09.5	3 10.0	3 00.9	38	0.8	98	2.0	158	3.3
39	3 09.8	3 10.3	3 01.1	39	0.8	99	2.1	159	3.3
40	3 10.0	3 10.5	3 01.3	40	0.8	100	2.1	160	3.3
41	3 10.3	3 10.8	3 01.6	41	0.9	101	2.1	161	3.4
42	3 10.5	3 11.0	3 01.8	42	0.9	102	2.1	162	3.4
43	3 10.8	3 11.3	3 02.1	43	0.9	103	2.1	163	3.4
44	3 11.0	3 11.5	3 02.3	44	0.9	104	2.2	164	3.4
45	3 11.3	3 11.8	3 02.5	45	0.9	105	2.2	165	3.4
46	3 11.5	3 12.0	3 02.8	46	1.0	106	2.2	166	3.5
47	3 11.8	3 12.3	3 03.0	47	1.0	107	2.2	167	3.5
48	3 12.0	3 12.5	3 03.3	48	1.0	108	2.3	168	3.5
49	3 12.3	3 12.8	3 03.5	49	1.0	109	2.3	169	3.5
50	3 12.5	3 13.0	3 03.7	50	1.0	110	2.3	170	3.5
51	3 12.8	3 13.3	3 04.0	51	1.1	111	2.3	171	3.6
52	3 13.0	3 13.5	3 04.2	52	1.1	112	2.3	172	3.6
53	3 13.3	3 13.8	3 04.4	53	1.1	113	2.4	173	3.6
54	3 13.5	3 14.0	3 04.7	54	1.1	114	2.4	174	3.6
55	3 13.8	3 14.3	3 04.9	55	1.1	115	2.4	175	3.6
56	3 14.0	3 14.5	3 05.2	56	1.2	116	2.4	176	3.7
57	3 14.3	3 14.8	3 05.4	57	1.2	117	2.4	177	3.7
58	3 14.5	3 15.0	3 05.6	58	1.2	118	2.5	178	3.7
59	3 14.8	3 15.3	3 05.9	59	1.2	119	2.5	179	3.7
60	3 15.0	3 15.5	3 06.1	60	1.3	120	2.5	180	3.8

13m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	3 15.0	3 15.5	3 06.1	0	0.0	60	1.4	120	2.7
1	3 15.3	3 15.8	3 06.4	1	0.0	61	1.4	121	2.7
2	3 15.5	3 16.0	3 06.6	2	0.0	62	1.4	122	2.7
3	3 15.8	3 16.3	3 06.8	3	0.1	63	1.4	123	2.8
4	3 16.0	3 16.5	3 07.1	4	0.1	64	1.4	124	2.8
5	3 16.3	3 16.8	3 07.3	5	0.1	65	1.5	125	2.8
6	3 16.5	3 17.0	3 07.5	6	0.1	66	1.5	126	2.8
7	3 16.8	3 17.3	3 07.8	7	0.2	67	1.5	127	2.9
8	3 17.0	3 17.5	3 08.0	8	0.2	68	1.5	128	2.9
9	3 17.3	3 17.8	3 08.3	9	0.2	69	1.6	129	2.9
10	3 17.5	3 18.0	3 08.5	10	0.2	70	1.6	130	2.9
11	3 17.8	3 18.3	3 08.7	11	0.2	71	1.6	131	2.9
12	3 18.0	3 18.5	3 09.0	12	0.3	72	1.6	132	3.0
13	3 18.3	3 18.8	3 09.2	13	0.3	73	1.6	133	3.0
14	3 18.5	3 19.0	3 09.5	14	0.3	74	1.7	134	3.0
15	3 18.8	3 19.3	3 09.7	15	0.3	75	1.7	135	3.0
16	3 19.0	3 19.5	3 09.9	16	0.4	76	1.7	136	3.1
17	3 19.3	3 19.8	3 10.2	17	0.4	77	1.7	137	3.1
18	3 19.5	3 20.0	3 10.4	18	0.4	78	1.8	138	3.1
19	3 19.8	3 20.3	3 10.7	19	0.4	79	1.8	139	3.1
20	3 20.0	3 20.5	3 10.9	20	0.5	80	1.8	140	3.2
21	3 20.3	3 20.8	3 11.1	21	0.5	81	1.8	141	3.2
22	3 20.5	3 21.0	3 11.4	22	0.5	82	1.8	142	3.2
23	3 20.8	3 21.3	3 11.6	23	0.5	83	1.9	143	3.2
24	3 21.0	3 21.6	3 11.8	24	0.5	84	1.9	144	3.2
25	3 21.3	3 21.8	3 12.1	25	0.6	85	1.9	145	3.3
26	3 21.5	3 22.1	3 12.3	26	0.6	86	1.9	146	3.3
27	3 21.8	3 22.3	3 12.6	27	0.6	87	2.0	147	3.3
28	3 22.0	3 22.6	3 12.8	28	0.6	88	2.0	148	3.3
29	3 22.3	3 22.8	3 13.0	29	0.7	89	2.0	149	3.4
30	3 22.5	3 23.1	3 13.3	30	0.7	90	2.0	150	3.4
31	3 22.8	3 23.3	3 13.5	31	0.7	91	2.0	151	3.4
32	3 23.0	3 23.6	3 13.8	32	0.7	92	2.1	152	3.4
33	3 23.3	3 23.8	3 14.0	33	0.7	93	2.1	153	3.4
34	3 23.5	3 24.1	3 14.2	34	0.8	94	2.1	154	3.5
35	3 23.8	3 24.3	3 14.5	35	0.8	95	2.1	155	3.5
36	3 24.0	3 24.6	3 14.7	36	0.8	96	2.2	156	3.5
37	3 24.3	3 24.8	3 14.9	37	0.8	97	2.2	157	3.5
38	3 24.5	3 25.1	3 15.2	38	0.9	98	2.2	158	3.6
39	3 24.8	3 25.3	3 15.4	39	0.9	99	2.2	159	3.6
40	3 25.0	3 25.6	3 15.7	40	0.9	100	2.3	160	3.6
41	3 25.3	3 25.8	3 15.9	41	0.9	101	2.3	161	3.6
42	3 25.5	3 26.1	3 16.1	42	0.9	102	2.3	162	3.6
43	3 25.8	3 26.3	3 16.4	43	1.0	103	2.3	163	3.7
44	3 26.0	3 26.6	3 16.6	44	1.0	104	2.3	164	3.7
45	3 26.3	3 26.8	3 16.9	45	1.0	105	2.4	165	3.7
46	3 26.5	3 27.1	3 17.1	46	1.0	106	2.4	166	3.7
47	3 26.8	3 27.3	3 17.3	47	1.1	107	2.4	167	3.8
48	3 27.0	3 27.6	3 17.6	48	1.1	108	2.4	168	3.8
49	3 27.3	3 27.8	3 17.8	49	1.1	109	2.5	169	3.8
50	3 27.5	3 28.1	3 18.0	50	1.1	110	2.5	170	3.8
51	3 27.8	3 28.3	3 18.3	51	1.1	111	2.5	171	3.8
52	3 28.0	3 28.6	3 18.5	52	1.2	112	2.5	172	3.9
53	3 28.3	3 28.8	3 18.8	53	1.2	113	2.5	173	3.9
54	3 28.5	3 29.1	3 19.0	54	1.2	114	2.6	174	3.9
55	3 28.8	3 29.3	3 19.2	55	1.2	115	2.6	175	3.9
56	3 29.0	3 29.6	3 19.5	56	1.3	116	2.6	176	4.0
57	3 29.3	3 29.8	3 19.7	57	1.3	117	2.6	177	4.0
58	3 29.5	3 30.1	3 20.0	58	1.3	118	2.7	178	4.0
59	3 29.8	3 30.3	3 20.2	59	1.3	119	2.7	179	4.0
60	3 30.0	3 30.6	3 20.4	60	1.4	120	2.7	180	4.1

14m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	3 30.0	3 30.6	3 20.4	0	0.0	60	1.5	120	2.9
1	3 30.3	3 30.8	3 20.7	1	0.0	61	1.5	121	2.9
2	3 30.5	3 31.1	3 20.9	2	0.0	62	1.5	122	2.9
3	3 30.8	3 31.3	3 21.1	3	0.1	63	1.5	123	3.0
4	3 31.0	3 31.6	3 21.4	4	0.1	64	1.5	124	3.0
5	3 31.3	3 31.8	3 21.6	5	0.1	65	1.6	125	3.0
6	3 31.5	3 32.1	3 21.9	6	0.1	66	1.6	126	3.0
7	3 31.8	3 32.3	3 22.1	7	0.2	67	1.6	127	3.1
8	3 32.0	3 32.6	3 22.3	8	0.2	68	1.6	128	3.1
9	3 32.3	3 32.8	3 22.6	9	0.2	69	1.7	129	3.1
10	3 32.5	3 33.1	3 22.8	10	0.2	70	1.7	130	3.1
11	3 32.8	3 33.3	3 23.1	11	0.3	71	1.7	131	3.2
12	3 33.0	3 33.6	3 23.3	12	0.3	72	1.7	132	3.2
13	3 33.3	3 33.8	3 23.5	13	0.3	73	1.8	133	3.2
14	3 33.5	3 34.1	3 23.8	14	0.3	74	1.8	134	3.2
15	3 33.8	3 34.3	3 24.0	15	0.4	75	1.8	135	3.3
16	3 34.0	3 34.6	3 24.3	16	0.4	76	1.8	136	3.3
17	3 34.3	3 34.8	3 24.5	17	0.4	77	1.9	137	3.3
18	3 34.5	3 35.1	3 24.7	18	0.4	78	1.9	138	3.3
19	3 34.8	3 35.3	3 25.0	19	0.5	79	1.9	139	3.4
20	3 35.0	3 35.6	3 25.2	20	0.5	80	1.9	140	3.4
21	3 35.3	3 35.8	3 25.4	21	0.5	81	2.0	141	3.4
22	3 35.5	3 36.1	3 25.7	22	0.5	82	2.0	142	3.4
23	3 35.8	3 36.3	3 25.9	23	0.6	83	2.0	143	3.5
24	3 36.0	3 36.6	3 26.2	24	0.6	84	2.0	144	3.5
25	3 36.3	3 36.8	3 26.4	25	0.6	85	2.1	145	3.5
26	3 36.5	3 37.1	3 26.6	26	0.6	86	2.1	146	3.5
27	3 36.8	3 37.3	3 26.9	27	0.7	87	2.1	147	3.6
28	3 37.0	3 37.6	3 27.1	28	0.7	88	2.1	148	3.6
29	3 37.3	3 37.8	3 27.4	29	0.7	89	2.2	149	3.6
30	3 37.5	3 38.1	3 27.6	30	0.7	90	2.2	150	3.6
31	3 37.8	3 38.3	3 27.8	31	0.7	91	2.2	151	3.6
32	3 38.0	3 38.6	3 28.1	32	0.8	92	2.2	152	3.7
33	3 38.3	3 38.8	3 28.3	33	0.8	93	2.2	153	3.7
34	3 38.5	3 39.1	3 28.5	34	0.8	94	2.3	154	3.7
35	3 38.8	3 39.3	3 28.8	35	0.8	95	2.3	155	3.7
36	3 39.0	3 39.6	3 29.0	36	0.9	96	2.3	156	3.8
37	3 39.3	3 39.9	3 29.3	37	0.9	97	2.3	157	3.8
38	3 39.5	3 40.1	3 29.5	38	0.9	98	2.4	158	3.8
39	3 39.8	3 40.4	3 29.7	39	0.9	99	2.4	159	3.8
40	3 40.0	3 40.6	3 30.0	40	1.0	100	2.4	160	3.9
41	3 40.3	3 40.9	3 30.2	41	1.0	101	2.4	161	3.9
42	3 40.5	3 41.1	3 30.5	42	1.0	102	2.5	162	3.9
43	3 40.8	3 41.4	3 30.7	43	1.0	103	2.5	163	3.9
44	3 41.0	3 41.6	3 30.9	44	1.1	104	2.5	164	4.0
45	3 41.3	3 41.9	3 31.2	45	1.1	105	2.5	165	4.0
46	3 41.5	3 42.1	3 31.4	46	1.1	106	2.6	166	4.0
47	3 41.8	3 42.4	3 31.6	47	1.1	107	2.6	167	4.0
48	3 42.0	3 42.6	3 31.9	48	1.2	108	2.6	168	4.1
49	3 42.3	3 42.9	3 32.1	49	1.2	109	2.6	169	4.1
50	3 42.5	3 43.1	3 32.4	50	1.2	110	2.7	170	4.1
51	3 42.8	3 43.4	3 32.6	51	1.2	111	2.7	171	4.1
52	3 43.0	3 43.6	3 32.8	52	1.3	112	2.7	172	4.2
53	3 43.3	3 43.9	3 33.1	53	1.3	113	2.7	173	4.2
54	3 43.5	3 44.1	3 33.3	54	1.3	114	2.8	174	4.2
55	3 43.8	3 44.4	3 33.6	55	1.3	115	2.8	175	4.2
56	3 44.0	3 44.6	3 33.8	56	1.4	116	2.8	176	4.3
57	3 44.3	3 44.9	3 34.0	57	1.4	117	2.8	177	4.3
58	3 44.5	3 45.1	3 34.3	58	1.4	118	2.9	178	4.3
59	3 44.8	3 45.4	3 34.5	59	1.4	119	2.9	179	4.3
60	3 45.0	3 45.6	3 34.8	60	1.5	120	2.9	180	4.4

15m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	3 45.0	3 45.6	3 34.8	0	0.0	60	1.6	120	3.1
1	3 45.3	3 45.9	3 35.0	1	0.0	61	1.6	121	3.1
2	3 45.5	3 46.1	3 35.2	2	0.1	62	1.6	122	3.2
3	3 45.8	3 46.4	3 35.5	3	0.1	63	1.6	123	3.2
4	3 46.0	3 46.6	3 35.7	4	0.1	64	1.7	124	3.2
5	3 46.3	3 46.9	3 35.9	5	0.1	65	1.7	125	3.2
6	3 46.5	3 47.1	3 36.2	6	0.2	66	1.7	126	3.3
7	3 46.8	3 47.4	3 36.4	7	0.2	67	1.7	127	3.3
8	3 47.0	3 47.6	3 36.7	8	0.2	68	1.8	128	3.3
9	3 47.3	3 47.9	3 36.9	9	0.2	69	1.8	129	3.3
10	3 47.5	3 48.1	3 37.1	10	0.3	70	1.8	130	3.4
11	3 47.8	3 48.4	3 37.4	11	0.3	71	1.8	131	3.4
12	3 48.0	3 48.6	3 37.6	12	0.3	72	1.9	132	3.4
13	3 48.3	3 48.9	3 37.9	13	0.3	73	1.9	133	3.4
14	3 48.5	3 49.1	3 38.1	14	0.4	74	1.9	134	3.5
15	3 48.8	3 49.4	3 38.3	15	0.4	75	1.9	135	3.5
16	3 49.0	3 49.6	3 38.6	16	0.4	76	2.0	136	3.5
17	3 49.3	3 49.9	3 38.8	17	0.4	77	2.0	137	3.5
18	3 49.5	3 50.1	3 39.0	18	0.5	78	2.0	138	3.6
19	3 49.8	3 50.4	3 39.3	19	0.5	79	2.0	139	3.6
20	3 50.0	3 50.6	3 39.5	20	0.5	80	2.1	140	3.6
21	3 50.3	3 50.9	3 39.8	21	0.5	81	2.1	141	3.6
22	3 50.5	3 51.1	3 40.0	22	0.6	82	2.1	142	3.7
23	3 50.8	3 51.4	3 40.2	23	0.6	83	2.1	143	3.7
24	3 51.0	3 51.6	3 40.5	24	0.6	84	2.2	144	3.7
25	3 51.3	3 51.9	3 40.7	25	0.6	85	2.2	145	3.7
26	3 51.5	3 52.1	3 41.0	26	0.7	86	2.2	146	3.8
27	3 51.8	3 52.4	3 41.2	27	0.7	87	2.2	147	3.8
28	3 52.0	3 52.6	3 41.4	28	0.7	88	2.3	148	3.8
29	3 52.3	3 52.9	3 41.7	29	0.7	89	2.3	149	3.8
30	3 52.5	3 53.1	3 41.9	30	0.8	90	2.3	150	3.9
31	3 52.8	3 53.4	3 42.1	31	0.8	91	2.4	151	3.9
32	3 53.0	3 53.6	3 42.4	32	0.8	92	2.4	152	3.9
33	3 53.3	3 53.9	3 42.6	33	0.9	93	2.4	153	4.0
34	3 53.5	3 54.1	3 42.9	34	0.9	94	2.4	154	4.0
35	3 53.8	3 54.4	3 43.1	35	0.9	95	2.5	155	4.0
36	3 54.0	3 54.6	3 43.3	36	0.9	96	2.5	156	4.0
37	3 54.3	3 54.9	3 43.6	37	1.0	97	2.5	157	4.1
38	3 54.5	3 55.1	3 43.8	38	1.0	98	2.5	158	4.1
39	3 54.8	3 55.4	3 44.1	39	1.0	99	2.6	159	4.1
40	3 55.0	3 55.6	3 44.3	40	1.0	100	2.6	160	4.1
41	3 55.3	3 55.9	3 44.5	41	1.1	101	2.6	161	4.2
42	3 55.5	3 56.1	3 44.8	42	1.1	102	2.6	162	4.2
43	3 55.8	3 56.4	3 45.0	43	1.1	103	2.7	163	4.2
44	3 56.0	3 56.6	3 45.2	44	1.1	104	2.7	164	4.2
45	3 56.3	3 56.9	3 45.5	45	1.2	105	2.7	165	4.3
46	3 56.5	3 57.1	3 45.7	46	1.2	106	2.7	166	4.3
47	3 56.8	3 57.4	3 46.0	47	1.2	107	2.8	167	4.3
48	3 57.0	3 57.6	3 46.2	48	1.2	108	2.8	168	4.3
49	3 57.3	3 57.9	3 46.4	49	1.3	109	2.8	169	4.4
50	3 57.5	3 58.2	3 46.7	50	1.3	110	2.8	170	4.4
51	3 57.8	3 58.4	3 46.9	51	1.3	111	2.9	171	4.4
52	3 58.0	3 58.7	3 47.2	52	1.3	112	2.9	172	4.4
53	3 58.3	3 58.9	3 47.4	53	1.4	113	2.9	173	4.5
54	3 58.5	3 59.2	3 47.6	54	1.4	114	2.9	174	4.5
55	3 58.8	3 59.4	3 47.9	55	1.4	115	3.0	175	4.5
56	3 59.0	3 59.7	3 48.1	56	1.4	116	3.0	176	4.5
57	3 59.3	3 59.9	3 48.4	57	1.5	117	3.0	177	4.6
58	3 59.5	4 00.2	3 48.6	58	1.5	118	3.0	178	4.6
59	3 59.8	4 00.4	3 48.8	59	1.5	119	3.1	179	4.6
60	4 00.0	4 00.7	3 49.1	60	1.6	120	3.1	180	4.7

16m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	4 00.0	4 00.7	3 49.1	0	0.0	60	1.7	120	3.3
1	4 00.3	4 00.9	3 49.3	1	0.0	61	1.7	121	3.3
2	4 00.5	4 01.2	3 49.5	2	0.1	62	1.7	122	3.4
3	4 00.8	4 01.4	3 49.8	3	0.1	63	1.7	123	3.4
4	4 01.0	4 01.7	3 50.0	4	0.1	64	1.8	124	3.4
5	4 01.3	4 01.9	3 50.3	5	0.1	65	1.8	125	3.4
6	4 01.5	4 02.2	3 50.5	6	0.2	66	1.8	126	3.5
7	4 01.8	4 02.4	3 50.7	7	0.2	67	1.8	127	3.5
8	4 02.0	4 02.7	3 51.0	8	0.2	68	1.9	128	3.5
9	4 02.3	4 02.9	3 51.2	9	0.2	69	1.9	129	3.5
10	4 02.5	4 03.2	3 51.5	10	0.3	70	1.9	130	3.6
11	4 02.8	4 03.4	3 51.7	11	0.3	71	2.0	131	3.6
12	4 03.0	4 03.7	3 51.9	12	0.3	72	2.0	132	3.6
13	4 03.3	4 03.9	3 52.2	13	0.4	73	2.0	133	3.7
14	4 03.5	4 04.2	3 52.4	14	0.4	74	2.0	134	3.7
15	4 03.8	4 04.4	3 52.6	15	0.4	75	2.1	135	3.7
16	4 04.0	4 04.7	3 52.9	16	0.4	76	2.1	136	3.7
17	4 04.3	4 04.9	3 53.1	17	0.5	77	2.1	137	3.8
18	4 04.5	4 05.2	3 53.4	18	0.5	78	2.1	138	3.8
19	4 04.8	4 05.4	3 53.6	19	0.5	79	2.2	139	3.8
20	4 05.0	4 05.7	3 53.8	20	0.6	80	2.2	140	3.9
21	4 05.3	4 05.9	3 54.1	21	0.6	81	2.2	141	3.9
22	4 05.5	4 06.2	3 54.3	22	0.6	82	2.3	142	3.9
23	4 05.8	4 06.4	3 54.6	23	0.6	83	2.3	143	3.9
24	4 06.0	4 06.7	3 54.8	24	0.7	84	2.3	144	4.0
25	4 06.3	4 06.9	3 55.0	25	0.7	85	2.3	145	4.0
26	4 06.5	4 07.2	3 55.3	26	0.7	86	2.4	146	4.0
27	4 06.8	4 07.4	3 55.5	27	0.7	87	2.4	147	4.0
28	4 07.0	4 07.7	3 55.7	28	0.8	88	2.4	148	4.1
29	4 07.3	4 07.9	3 56.0	29	0.8	89	2.4	149	4.1
30	4 07.5	4 08.2	3 56.2	30	0.8	90	2.5	150	4.1
31	4 07.8	4 08.4	3 56.5	31	0.9	91	2.5	151	4.2
32	4 08.0	4 08.7	3 56.7	32	0.9	92	2.5	152	4.2
33	4 08.3	4 08.9	3 56.9	33	0.9	93	2.6	153	4.2
34	4 08.5	4 09.2	3 57.2	34	0.9	94	2.6	154	4.2
35	4 08.8	4 09.4	3 57.4	35	1.0	95	2.6	155	4.3
36	4 09.0	4 09.7	3 57.7	36	1.0	96	2.6	156	4.3
37	4 09.3	4 09.9	3 57.9	37	1.0	97	2.7	157	4.3
38	4 09.5	4 10.2	3 58.1	38	1.0	98	2.7	158	4.3
39	4 09.8	4 10.4	3 58.4	39	1.1	99	2.7	159	4.4
40	4 10.0	4 10.7	3 58.6	40	1.1	100	2.8	160	4.4
41	4 10.3	4 10.9	3 58.8	41	1.1	101	2.8	161	4.4
42	4 10.5	4 11.2	3 59.1	42	1.2	102	2.8	162	4.5
43	4 10.8	4 11.4	3 59.3	43	1.2	103	2.8	163	4.5
44	4 11.0	4 11.7	3 59.6	44	1.2	104	2.9	164	4.5
45	4 11.3	4 11.9	3 59.8	45	1.2	105	2.9	165	4.5
46	4 11.5	4 12.2	4 00.0	46	1.3	106	2.9	166	4.6
47	4 11.8	4 12.4	4 00.3	47	1.3	107	2.9	167	4.6
48	4 12.0	4 12.7	4 00.5	48	1.3	108	3.0	168	4.6
49	4 12.3	4 12.9	4 00.8	49	1.3	109	3.0	169	4.6
50	4 12.5	4 13.2	4 01.0	50	1.4	110	3.0	170	4.7
51	4 12.8	4 13.4	4 01.2	51	1.4	111	3.1	171	4.7
52	4 13.0	4 13.7	4 01.5	52	1.4	112	3.1	172	4.7
53	4 13.3	4 13.9	4 01.7	53	1.5	113	3.1	173	4.8
54	4 13.5	4 14.2	4 02.0	54	1.5	114	3.1	174	4.8
55	4 13.8	4 14.4	4 02.2	55	1.5	115	3.2	175	4.8
56	4 14.0	4 14.7	4 02.4	56	1.5	116	3.2	176	4.8
57	4 14.3	4 14.9	4 02.7	57	1.6	117	3.2	177	4.9
58	4 14.5	4 15.2	4 02.9	58	1.6	118	3.2	178	4.9
59	4 14.8	4 15.4	4 03.1	59	1.6	119	3.3	179	4.9
60	4 15.0	4 15.7	4 03.4	60	1.7	120	3.3	180	5.0

17m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	4 15.0	4 15.7	4 03.4	0	0.0	60	1.8	120	3.5
1	4 15.3	4 15.9	4 03.6	1	0.0	61	1.8	121	3.5
2	4 15.5	4 16.2	4 03.9	2	0.1	62	1.8	122	3.6
3	4 15.8	4 16.5	4 04.1	3	0.1	63	1.8	123	3.6
4	4 16.0	4 16.7	4 04.3	4	0.1	64	1.9	124	3.6
5	4 16.3	4 17.0	4 04.6	5	0.1	65	1.9	125	3.6
6	4 16.5	4 17.2	4 04.8	6	0.2	66	1.9	126	3.7
7	4 16.8	4 17.5	4 05.1	7	0.2	67	2.0	127	3.7
8	4 17.0	4 17.7	4 05.3	8	0.2	68	2.0	128	3.7
9	4 17.3	4 18.0	4 05.5	9	0.3	69	2.0	129	3.8
10	4 17.5	4 18.2	4 05.8	10	0.3	70	2.0	130	3.8
11	4 17.8	4 18.5	4 06.0	11	0.3	71	2.1	131	3.8
12	4 18.0	4 18.7	4 06.2	12	0.4	72	2.1	132	3.9
13	4 18.3	4 19.0	4 06.5	13	0.4	73	2.1	133	3.9
14	4 18.5	4 19.2	4 06.7	14	0.4	74	2.2	134	3.9
15	4 18.8	4 19.5	4 07.0	15	0.4	75	2.2	135	3.9
16	4 19.0	4 19.7	4 07.2	16	0.5	76	2.2	136	4.0
17	4 19.3	4 20.0	4 07.4	17	0.5	77	2.2	137	4.0
18	4 19.5	4 20.2	4 07.7	18	0.5	78	2.3	138	4.0
19	4 19.8	4 20.5	4 07.9	19	0.6	79	2.3	139	4.1
20	4 20.0	4 20.7	4 08.2	20	0.6	80	2.3	140	4.1
21	4 20.3	4 21.0	4 08.4	21	0.6	81	2.4	141	4.1
22	4 20.5	4 21.2	4 08.6	22	0.6	82	2.4	142	4.1
23	4 20.8	4 21.5	4 08.9	23	0.7	83	2.4	143	4.2
24	4 21.0	4 21.7	4 09.1	24	0.7	84	2.5	144	4.2
25	4 21.3	4 22.0	4 09.3	25	0.7	85	2.5	145	4.2
26	4 21.5	4 22.2	4 09.6	26	0.8	86	2.5	146	4.3
27	4 21.8	4 22.5	4 09.8	27	0.8	87	2.5	147	4.3
28	4 22.0	4 22.7	4 10.1	28	0.8	88	2.6	148	4.3
29	4 22.3	4 23.0	4 10.3	29	0.8	89	2.6	149	4.3
30	4 22.5	4 23.2	4 10.5	30	0.9	90	2.6	150	4.4
31	4 22.8	4 23.5	4 10.8	31	0.9	91	2.7	151	4.4
32	4 23.0	4 23.7	4 11.0	32	0.9	92	2.7	152	4.4
33	4 23.3	4 24.0	4 11.3	33	1.0	93	2.7	153	4.5
34	4 23.5	4 24.2	4 11.5	34	1.0	94	2.7	154	4.5
35	4 23.8	4 24.5	4 11.7	35	1.0	95	2.8	155	4.5
36	4 24.0	4 24.7	4 12.0	36	1.1	96	2.8	156	4.6
37	4 24.3	4 25.0	4 12.2	37	1.1	97	2.8	157	4.6
38	4 24.5	4 25.2	4 12.5	38	1.1	98	2.9	158	4.6
39	4 24.8	4 25.5	4 12.7	39	1.1	99	2.9	159	4.6
40	4 25.0	4 25.7	4 12.9	40	1.2	100	2.9	160	4.7
41	4 25.3	4 26.0	4 13.2	41	1.2	101	2.9	161	4.7
42	4 25.5	4 26.2	4 13.4	42	1.2	102	3.0	162	4.7
43	4 25.8	4 26.5	4 13.6	43	1.3	103	3.0	163	4.8
44	4 26.0	4 26.7	4 13.9	44	1.3	104	3.0	164	4.8
45	4 26.3	4 27.0	4 14.1	45	1.3	105	3.1	165	4.8
46	4 26.5	4 27.2	4 14.4	46	1.3	106	3.1	166	4.8
47	4 26.8	4 27.5	4 14.6	47	1.4	107	3.1	167	4.9
48	4 27.0	4 27.7	4 14.8	48	1.4	108	3.2	168	4.9
49	4 27.3	4 28.0	4 15.1	49	1.4	109	3.2	169	4.9
50	4 27.5	4 28.2	4 15.3	50	1.5	110	3.2	170	5.0
51	4 27.8	4 28.5	4 15.6	51	1.5	111	3.2	171	5.0
52	4 28.0	4 28.7	4 15.8	52	1.5	112	3.3	172	5.0
53	4 28.3	4 29.0	4 16.0	53	1.5	113	3.3	173	5.0
54	4 28.5	4 29.2	4 16.3	54	1.6	114	3.3	174	5.1
55	4 28.8	4 29.5	4 16.5	55	1.6	115	3.4	175	5.1
56	4 29.0	4 29.7	4 16.7	56	1.6	116	3.4	176	5.1
57	4 29.3	4 30.0	4 17.0	57	1.7	117	3.4	177	5.2
58	4 29.5	4 30.2	4 17.2	58	1.7	118	3.4	178	5.2
59	4 29.8	4 30.5	4 17.5	59	1.7	119	3.5	179	5.2
60	4 30.0	4 30.7	4 17.7	60	1.8	120	3.5	180	5.3

18m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	4 30.0	4 30.7	4 17.7	0	0.0	60	1.9	120	3.7
1	4 30.3	4 31.0	4 17.9	1	0.0	61	1.9	121	3.7
2	4 30.5	4 31.2	4 18.2	2	0.1	62	1.9	122	3.8
3	4 30.8	4 31.5	4 18.4	3	0.1	63	1.9	123	3.8
4	4 31.0	4 31.7	4 18.7	4	0.1	64	2.0	124	3.8
5	4 31.3	4 32.0	4 18.9	5	0.2	65	2.0	125	3.9
6	4 31.5	4 32.2	4 19.1	6	0.2	66	2.0	126	3.9
7	4 31.8	4 32.5	4 19.4	7	0.2	67	2.1	127	3.9
8	4 32.0	4 32.7	4 19.6	8	0.2	68	2.1	128	3.9
9	4 32.3	4 33.0	4 19.8	9	0.3	69	2.1	129	4.0
10	4 32.5	4 33.2	4 20.1	10	0.3	70	2.2	130	4.0
11	4 32.8	4 33.5	4 20.3	11	0.3	71	2.2	131	4.0
12	4 33.0	4 33.7	4 20.6	12	0.4	72	2.2	132	4.1
13	4 33.3	4 34.0	4 20.8	13	0.4	73	2.3	133	4.1
14	4 33.5	4 34.2	4 21.0	14	0.4	74	2.3	134	4.1
15	4 33.8	4 34.5	4 21.3	15	0.5	75	2.3	135	4.2
16	4 34.0	4 34.8	4 21.5	16	0.5	76	2.3	136	4.2
17	4 34.3	4 35.0	4 21.8	17	0.5	77	2.4	137	4.2
18	4 34.5	4 35.3	4 22.0	18	0.6	78	2.4	138	4.3
19	4 34.8	4 35.5	4 22.2	19	0.6	79	2.4	139	4.3
20	4 35.0	4 35.8	4 22.5	20	0.6	80	2.5	140	4.3
21	4 35.3	4 36.0	4 22.7	21	0.6	81	2.5	141	4.3
22	4 35.5	4 36.3	4 22.9	22	0.7	82	2.5	142	4.4
23	4 35.8	4 36.5	4 23.2	23	0.7	83	2.6	143	4.4
24	4 36.0	4 36.8	4 23.4	24	0.7	84	2.6	144	4.4
25	4 36.3	4 37.0	4 23.7	25	0.8	85	2.6	145	4.5
26	4 36.5	4 37.3	4 23.9	26	0.8	86	2.7	146	4.5
27	4 36.8	4 37.5	4 24.1	27	0.8	87	2.7	147	4.5
28	4 37.0	4 37.8	4 24.4	28	0.9	88	2.7	148	4.6
29	4 37.3	4 38.0	4 24.6	29	0.9	89	2.7	149	4.6
30	4 37.5	4 38.3	4 24.9	30	0.9	90	2.8	150	4.6
31	4 37.8	4 38.5	4 25.1	31	1.0	91	2.8	151	4.7
32	4 38.0	4 38.8	4 25.3	32	1.0	92	2.8	152	4.7
33	4 38.3	4 39.0	4 25.6	33	1.0	93	2.9	153	4.7
34	4 38.5	4 39.3	4 25.8	34	1.0	94	2.9	154	4.7
35	4 38.8	4 39.5	4 26.1	35	1.1	95	2.9	155	4.8
36	4 39.0	4 39.8	4 26.3	36	1.1	96	3.0	156	4.8
37	4 39.3	4 40.0	4 26.5	37	1.1	97	3.0	157	4.8
38	4 39.5	4 40.3	4 26.8	38	1.2	98	3.0	158	4.9
39	4 39.8	4 40.5	4 27.0	39	1.2	99	3.1	159	4.9
40	4 40.0	4 40.8	4 27.2	40	1.2	100	3.1	160	4.9
41	4 40.3	4 41.0	4 27.5	41	1.3	101	3.1	161	5.0
42	4 40.5	4 41.3	4 27.7	42	1.3	102	3.1	162	5.0
43	4 40.8	4 41.5	4 28.0	43	1.3	103	3.2	163	5.0
44	4 41.0	4 41.8	4 28.2	44	1.4	104	3.2	164	5.1
45	4 41.3	4 42.0	4 28.4	45	1.4	105	3.2	165	5.1
46	4 41.5	4 42.3	4 28.7	46	1.4	106	3.3	166	5.1
47	4 41.8	4 42.5	4 28.9	47	1.4	107	3.3	167	5.1
48	4 42.0	4 42.8	4 29.2	48	1.5	108	3.3	168	5.2
49	4 42.3	4 43.0	4 29.4	49	1.5	109	3.4	169	5.2
50	4 42.5	4 43.3	4 29.6	50	1.5	110	3.4	170	5.2
51	4 42.8	4 43.5	4 29.9	51	1.6	111	3.4	171	5.3
52	4 43.0	4 43.8	4 30.1	52	1.6	112	3.5	172	5.3
53	4 43.3	4 44.0	4 30.3	53	1.6	113	3.5	173	5.3
54	4 43.5	4 44.3	4 30.6	54	1.7	114	3.5	174	5.4
55	4 43.8	4 44.5	4 30.8	55	1.7	115	3.5	175	5.4
56	4 44.0	4 44.8	4 31.1	56	1.7	116	3.6	176	5.4
57	4 44.3	4 45.0	4 31.3	57	1.8	117	3.6	177	5.5
58	4 44.5	4 45.3	4 31.5	58	1.8	118	3.6	178	5.5
59	4 44.8	4 45.5	4 31.8	59	1.8	119	3.7	179	5.5
60	4 45.0	4 45.8	4 32.0	60	1.9	120	3.7	180	5.6

19m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	4 45.0	4 45.8	4 32.0	0	0.0	60	2.0	120	3.9
1	4 45.3	4 46.0	4 32.3	1	0.0	61	2.0	121	3.9
2	4 45.5	4 46.3	4 32.5	2	0.1	62	2.0	122	4.0
3	4 45.8	4 46.5	4 32.7	3	0.1	63	2.0	123	4.0
4	4 46.0	4 46.8	4 33.0	4	0.1	64	2.1	124	4.0
5	4 46.3	4 47.0	4 33.2	5	0.2	65	2.1	125	4.1
6	4 46.5	4 47.3	4 33.4	6	0.2	66	2.1	126	4.1
7	4 46.8	4 47.5	4 33.7	7	0.2	67	2.2	127	4.1
8	4 47.0	4 47.8	4 33.9	8	0.3	68	2.2	128	4.2
9	4 47.3	4 48.0	4 34.2	9	0.3	69	2.2	129	4.2
10	4 47.5	4 48.3	4 34.4	10	0.3	70	2.3	130	4.2
11	4 47.8	4 48.5	4 34.6	11	0.4	71	2.3	131	4.3
12	4 48.0	4 48.8	4 34.9	12	0.4	72	2.3	132	4.3
13	4 48.3	4 49.0	4 35.1	13	0.4	73	2.4	133	4.3
14	4 48.5	4 49.3	4 35.4	14	0.5	74	2.4	134	4.4
15	4 48.8	4 49.5	4 35.6	15	0.5	75	2.4	135	4.4
16	4 49.0	4 49.8	4 35.8	16	0.5	76	2.5	136	4.4
17	4 49.3	4 50.0	4 36.1	17	0.6	77	2.5	137	4.5
18	4 49.5	4 50.3	4 36.3	18	0.6	78	2.5	138	4.5
19	4 49.8	4 50.5	4 36.6	19	0.6	79	2.6	139	4.5
20	4 50.0	4 50.8	4 36.8	20	0.7	80	2.6	140	4.6
21	4 50.3	4 51.0	4 37.0	21	0.7	81	2.6	141	4.6
22	4 50.5	4 51.3	4 37.3	22	0.7	82	2.7	142	4.6
23	4 50.8	4 51.5	4 37.5	23	0.7	83	2.7	143	4.6
24	4 51.0	4 51.8	4 37.7	24	0.8	84	2.7	144	4.7
25	4 51.3	4 52.0	4 38.0	25	0.8	85	2.8	145	4.7
26	4 51.5	4 52.3	4 38.2	26	0.8	86	2.8	146	4.7
27	4 51.8	4 52.5	4 38.5	27	0.9	87	2.8	147	4.8
28	4 52.0	4 52.8	4 38.7	28	0.9	88	2.9	148	4.8
29	4 52.3	4 53.1	4 38.9	29	0.9	89	2.9	149	4.8
30	4 52.5	4 53.3	4 39.2	30	1.0	90	2.9	150	4.9
31	4 52.8	4 53.6	4 39.4	31	1.0	91	3.0	151	4.9
32	4 53.0	4 53.8	4 39.7	32	1.0	92	3.0	152	4.9
33	4 53.3	4 54.1	4 39.9	33	1.1	93	3.0	153	5.0
34	4 53.5	4 54.3	4 40.1	34	1.1	94	3.1	154	5.0
35	4 53.8	4 54.6	4 40.4	35	1.1	95	3.1	155	5.0
36	4 54.0	4 54.8	4 40.6	36	1.2	96	3.1	156	5.1
37	4 54.3	4 55.1	4 40.8	37	1.2	97	3.2	157	5.1
38	4 54.5	4 55.3	4 41.1	38	1.2	98	3.2	158	5.1
39	4 54.8	4 55.6	4 41.3	39	1.3	99	3.2	159	5.2
40	4 55.0	4 55.8	4 41.6	40	1.3	100	3.3	160	5.2
41	4 55.3	4 56.1	4 41.8	41	1.3	101	3.3	161	5.2
42	4 55.5	4 56.3	4 42.0	42	1.4	102	3.3	162	5.3
43	4 55.8	4 56.6	4 42.3	43	1.4	103	3.3	163	5.3
44	4 56.0	4 56.8	4 42.5	44	1.4	104	3.4	164	5.3
45	4 56.3	4 57.1	4 42.8	45	1.5	105	3.4	165	5.4
46	4 56.5	4 57.3	4 43.0	46	1.5	106	3.4	166	5.4
47	4 56.8	4 57.6	4 43.2	47	1.5	107	3.5	167	5.4
48	4 57.0	4 57.8	4 43.5	48	1.6	108	3.5	168	5.5
49	4 57.3	4 58.1	4 43.7	49	1.6	109	3.5	169	5.5
50	4 57.5	4 58.3	4 43.9	50	1.6	110	3.6	170	5.5
51	4 57.8	4 58.6	4 44.2	51	1.7	111	3.6	171	5.6
52	4 58.0	4 58.8	4 44.4	52	1.7	112	3.6	172	5.6
53	4 58.3	4 59.1	4 44.7	53	1.7	113	3.7	173	5.6
54	4 58.5	4 59.3	4 44.9	54	1.8	114	3.7	174	5.7
55	4 58.8	4 59.6	4 45.1	55	1.8	115	3.7	175	5.7
56	4 59.0	4 59.8	4 45.4	56	1.8	116	3.8	176	5.7
57	4 59.3	5 00.1	4 45.6	57	1.9	117	3.8	177	5.8
58	4 59.5	5 00.3	4 45.9	58	1.9	118	3.8	178	5.8
59	4 59.8	5 00.6	4 46.1	59	1.9	119	3.9	179	5.8
60	5 00.0	5 00.8	4 46.3	60	2.0	120	3.9	180	5.9

20m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	5 00.0	5 00.8	4 46.3	0	0.0	60	2.1	120	4.1
1	5 00.3	5 01.1	4 46.6	1	0.0	61	2.1	121	4.1
2	5 00.5	5 01.3	4 46.8	2	0.1	62	2.1	122	4.2
3	5 00.8	5 01.6	4 47.0	3	0.1	63	2.2	123	4.2
4	5 01.0	5 01.8	4 47.3	4	0.1	64	2.2	124	4.2
5	5 01.3	5 02.1	4 47.5	5	0.2	65	2.2	125	4.3
6	5 01.5	5 02.3	4 47.8	6	0.2	66	2.3	126	4.3
7	5 01.8	5 02.6	4 48.0	7	0.2	67	2.3	127	4.3
8	5 02.0	5 02.8	4 48.2	8	0.3	68	2.3	128	4.4
9	5 02.3	5 03.1	4 48.5	9	0.3	69	2.4	129	4.4
10	5 02.5	5 03.3	4 48.7	10	0.3	70	2.4	130	4.4
11	5 02.8	5 03.6	4 49.0	11	0.4	71	2.4	131	4.5
12	5 03.0	5 03.8	4 49.2	12	0.4	72	2.5	132	4.5
13	5 03.3	5 04.1	4 49.4	13	0.4	73	2.5	133	4.5
14	5 03.5	5 04.3	4 49.7	14	0.5	74	2.5	134	4.6
15	5 03.8	5 04.6	4 49.9	15	0.5	75	2.6	135	4.6
16	5 04.0	5 04.8	4 50.2	16	0.5	76	2.6	136	4.6
17	5 04.3	5 05.1	4 50.4	17	0.6	77	2.6	137	4.7
18	5 04.5	5 05.3	4 50.6	18	0.6	78	2.7	138	4.7
19	5 04.8	5 05.6	4 50.9	19	0.6	79	2.7	139	4.7
20	5 05.0	5 05.8	4 51.1	20	0.7	80	2.7	140	4.8
21	5 05.3	5 06.1	4 51.3	21	0.7	81	2.8	141	4.8
22	5 05.5	5 06.3	4 51.6	22	0.8	82	2.8	142	4.9
23	5 05.8	5 06.6	4 51.8	23	0.8	83	2.8	143	4.9
24	5 06.0	5 06.8	4 52.1	24	0.8	84	2.9	144	4.9
25	5 06.3	5 07.1	4 52.3	25	0.9	85	2.9	145	5.0
26	5 06.5	5 07.3	4 52.5	26	0.9	86	2.9	146	5.0
27	5 06.8	5 07.6	4 52.8	27	0.9	87	3.0	147	5.0
28	5 07.0	5 07.8	4 53.0	28	1.0	88	3.0	148	5.1
29	5 07.3	5 08.1	4 53.3	29	1.0	89	3.0	149	5.1
30	5 07.5	5 08.3	4 53.5	30	1.0	90	3.1	150	5.1
31	5 07.8	5 08.6	4 53.7	31	1.1	91	3.1	151	5.2
32	5 08.0	5 08.8	4 54.0	32	1.1	92	3.1	152	5.2
33	5 08.3	5 09.1	4 54.2	33	1.1	93	3.2	153	5.2
34	5 08.5	5 09.3	4 54.4	34	1.2	94	3.2	154	5.3
35	5 08.8	5 09.6	4 54.7	35	1.2	95	3.2	155	5.3
36	5 09.0	5 09.8	4 54.9	36	1.2	96	3.3	156	5.3
37	5 09.3	5 10.1	4 55.2	37	1.3	97	3.3	157	5.4
38	5 09.5	5 10.3	4 55.4	38	1.3	98	3.3	158	5.4
39	5 09.8	5 10.6	4 55.6	39	1.3	99	3.4	159	5.4
40	5 10.0	5 10.8	4 55.9	40	1.4	100	3.4	160	5.5
41	5 10.3	5 11.1	4 56.1	41	1.4	101	3.5	161	5.5
42	5 10.5	5 11.4	4 56.4	42	1.4	102	3.5	162	5.5
43	5 10.8	5 11.6	4 56.6	43	1.5	103	3.5	163	5.6
44	5 11.0	5 11.9	4 56.8	44	1.5	104	3.6	164	5.6
45	5 11.3	5 12.1	4 57.1	45	1.5	105	3.6	165	5.6
46	5 11.5	5 12.4	4 57.3	46	1.6	106	3.6	166	5.7
47	5 11.8	5 12.6	4 57.5	47	1.6	107	3.7	167	5.7
48	5 12.0	5 12.9	4 57.8	48	1.6	108	3.7	168	5.7
49	5 12.3	5 13.1	4 58.0	49	1.7	109	3.7	169	5.8
50	5 12.5	5 13.4	4 58.3	50	1.7	110	3.8	170	5.8
51	5 12.8	5 13.6	4 58.5	51	1.7	111	3.8	171	5.8
52	5 13.0	5 13.9	4 58.7	52	1.8	112	3.8	172	5.9
53	5 13.3	5 14.1	4 59.0	53	1.8	113	3.9	173	5.9
54	5 13.5	5 14.4	4 59.2	54	1.8	114	3.9	174	5.9
55	5 13.8	5 14.6	4 59.5	55	1.9	115	3.9	175	6.0
56	5 14.0	5 14.9	4 59.7	56	1.9	116	4.0	176	6.0
57	5 14.3	5 15.1	4 59.9	57	1.9	117	4.0	177	6.0
58	5 14.5	5 15.4	5 00.2	58	2.0	118	4.0	178	6.1
59	5 14.8	5 15.6	5 00.4	59	2.0	119	4.1	179	6.1
60	5 15.0	5 15.9	5 00.7	60	2.1	120	4.1	180	6.2

21m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	5 15.0	5 15.9	5 00.7	0	0.0	60	2.2	120	4.3
1	5 15.3	5 16.1	5 00.9	1	0.0	61	2.2	121	4.3
2	5 15.5	5 16.4	5 01.1	2	0.1	62	2.2	122	4.4
3	5 15.8	5 16.6	5 01.4	3	0.1	63	2.3	123	4.4
4	5 16.0	5 16.9	5 01.6	4	0.1	64	2.3	124	4.4
5	5 16.3	5 17.1	5 01.8	5	0.2	65	2.3	125	4.5
6	5 16.5	5 17.4	5 02.1	6	0.2	66	2.4	126	4.5
7	5 16.8	5 17.6	5 02.3	7	0.3	67	2.4	127	4.6
8	5 17.0	5 17.9	5 02.6	8	0.3	68	2.4	128	4.6
9	5 17.3	5 18.1	5 02.8	9	0.3	69	2.5	129	4.6
10	5 17.5	5 18.4	5 03.0	10	0.4	70	2.5	130	4.7
11	5 17.8	5 18.6	5 03.3	11	0.4	71	2.5	131	4.7
12	5 18.0	5 18.9	5 03.5	12	0.4	72	2.6	132	4.7
13	5 18.3	5 19.1	5 03.8	13	0.5	73	2.6	133	4.8
14	5 18.5	5 19.4	5 04.0	14	0.5	74	2.7	134	4.8
15	5 18.8	5 19.6	5 04.2	15	0.5	75	2.7	135	4.8
16	5 19.0	5 19.9	5 04.5	16	0.6	76	2.7	136	4.9
17	5 19.3	5 20.1	5 04.7	17	0.6	77	2.8	137	4.9
18	5 19.5	5 20.4	5 04.9	18	0.6	78	2.8	138	4.9
19	5 19.8	5 20.6	5 05.2	19	0.7	79	2.8	139	5.0
20	5 20.0	5 20.9	5 05.4	20	0.7	80	2.9	140	5.0
21	5 20.3	5 21.1	5 05.7	21	0.8	81	2.9	141	5.1
22	5 20.5	5 21.4	5 05.9	22	0.8	82	2.9	142	5.1
23	5 20.8	5 21.6	5 06.1	23	0.8	83	3.0	143	5.1
24	5 21.0	5 21.9	5 06.4	24	0.9	84	3.0	144	5.2
25	5 21.3	5 22.1	5 06.6	25	0.9	85	3.0	145	5.2
26	5 21.5	5 22.4	5 06.9	26	0.9	86	3.1	146	5.2
27	5 21.8	5 22.6	5 07.1	27	1.0	87	3.1	147	5.3
28	5 22.0	5 22.9	5 07.3	28	1.0	88	3.2	148	5.3
29	5 22.3	5 23.1	5 07.6	29	1.0	89	3.2	149	5.3
30	5 22.5	5 23.4	5 07.8	30	1.1	90	3.2	150	5.4
31	5 22.8	5 23.6	5 08.0	31	1.1	91	3.3	151	5.4
32	5 23.0	5 23.9	5 08.3	32	1.1	92	3.3	152	5.4
33	5 23.3	5 24.1	5 08.5	33	1.2	93	3.3	153	5.5
34	5 23.5	5 24.4	5 08.8	34	1.2	94	3.4	154	5.5
35	5 23.8	5 24.6	5 09.0	35	1.3	95	3.4	155	5.6
36	5 24.0	5 24.9	5 09.2	36	1.3	96	3.4	156	5.6
37	5 24.3	5 25.1	5 09.5	37	1.3	97	3.5	157	5.6
38	5 24.5	5 25.4	5 09.7	38	1.4	98	3.5	158	5.7
39	5 24.8	5 25.6	5 10.0	39	1.4	99	3.5	159	5.7
40	5 25.0	5 25.9	5 10.2	40	1.4	100	3.6	160	5.7
41	5 25.3	5 26.1	5 10.4	41	1.5	101	3.6	161	5.8
42	5 25.5	5 26.4	5 10.7	42	1.5	102	3.7	162	5.8
43	5 25.8	5 26.6	5 10.9	43	1.5	103	3.7	163	5.8
44	5 26.0	5 26.9	5 11.1	44	1.6	104	3.7	164	5.9
45	5 26.3	5 27.1	5 11.4	45	1.6	105	3.8	165	5.9
46	5 26.5	5 27.4	5 11.6	46	1.6	106	3.8	166	5.9
47	5 26.8	5 27.6	5 11.9	47	1.7	107	3.8	167	6.0
48	5 27.0	5 27.9	5 12.1	48	1.7	108	3.9	168	6.0
49	5 27.3	5 28.1	5 12.3	49	1.8	109	3.9	169	6.1
50	5 27.5	5 28.4	5 12.6	50	1.8	110	3.9	170	6.1
51	5 27.8	5 28.6	5 12.8	51	1.8	111	4.0	171	6.1
52	5 28.0	5 28.9	5 13.1	52	1.9	112	4.0	172	6.2
53	5 28.3	5 29.1	5 13.3	53	1.9	113	4.0	173	6.2
54	5 28.5	5 29.4	5 13.5	54	1.9	114	4.1	174	6.2
55	5 28.8	5 29.7	5 13.8	55	2.0	115	4.1	175	6.3
56	5 29.0	5 29.9	5 14.0	56	2.0	116	4.2	176	6.3
57	5 29.3	5 30.2	5 14.3	57	2.0	117	4.2	177	6.3
58	5 29.5	5 30.4	5 14.5	58	2.1	118	4.2	178	6.4
59	5 29.8	5 30.7	5 14.7	59	2.1	119	4.3	179	6.4
60	5 30.0	5 30.9	5 15.0	60	2.2	120	4.3	180	6.5

22m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	5 30.0	5 30.9	5 15.0	0	0.0	60	2.3	120	4.5
1	5 30.3	5 31.2	5 15.2	1	0.0	61	2.3	121	4.5
2	5 30.5	5 31.4	5 15.4	2	0.1	62	2.3	122	4.6
3	5 30.8	5 31.7	5 15.7	3	0.1	63	2.4	123	4.6
4	5 31.0	5 31.9	5 15.9	4	0.2	64	2.4	124	4.7
5	5 31.3	5 32.2	5 16.2	5	0.2	65	2.4	125	4.7
6	5 31.5	5 32.4	5 16.4	6	0.2	66	2.5	126	4.7
7	5 31.8	5 32.7	5 16.6	7	0.3	67	2.5	127	4.8
8	5 32.0	5 32.9	5 16.9	8	0.3	68	2.6	128	4.8
9	5 32.3	5 33.2	5 17.1	9	0.3	69	2.6	129	4.8
10	5 32.5	5 33.4	5 17.4	10	0.4	70	2.6	130	4.9
11	5 32.8	5 33.7	5 17.6	11	0.4	71	2.7	131	4.9
12	5 33.0	5 33.9	5 17.8	12	0.5	72	2.7	132	5.0
13	5 33.3	5 34.2	5 18.1	13	0.5	73	2.7	133	5.0
14	5 33.5	5 34.4	5 18.3	14	0.5	74	2.8	134	5.0
15	5 33.8	5 34.7	5 18.5	15	0.6	75	2.8	135	5.1
16	5 34.0	5 34.9	5 18.8	16	0.6	76	2.9	136	5.1
17	5 34.3	5 35.2	5 19.0	17	0.6	77	2.9	137	5.1
18	5 34.5	5 35.4	5 19.3	18	0.7	78	2.9	138	5.2
19	5 34.8	5 35.7	5 19.5	19	0.7	79	3.0	139	5.2
20	5 35.0	5 35.9	5 19.7	20	0.8	80	3.0	140	5.3
21	5 35.3	5 36.2	5 20.0	21	0.8	81	3.0	141	5.3
22	5 35.5	5 36.4	5 20.2	22	0.8	82	3.1	142	5.3
23	5 35.8	5 36.7	5 20.5	23	0.9	83	3.1	143	5.4
24	5 36.0	5 36.9	5 20.7	24	0.9	84	3.2	144	5.4
25	5 36.3	5 37.2	5 20.9	25	0.9	85	3.2	145	5.4
26	5 36.5	5 37.4	5 21.2	26	1.0	86	3.2	146	5.5
27	5 36.8	5 37.7	5 21.4	27	1.0	87	3.3	147	5.5
28	5 37.0	5 37.9	5 21.6	28	1.1	88	3.3	148	5.6
29	5 37.3	5 38.2	5 21.9	29	1.1	89	3.3	149	5.6
30	5 37.5	5 38.4	5 22.1	30	1.1	90	3.4	150	5.6
31	5 37.8	5 38.7	5 22.4	31	1.2	91	3.4	151	5.7
32	5 38.0	5 38.9	5 22.6	32	1.2	92	3.5	152	5.7
33	5 38.3	5 39.2	5 22.8	33	1.2	93	3.5	153	5.7
34	5 38.5	5 39.4	5 23.1	34	1.3	94	3.5	154	5.8
35	5 38.8	5 39.7	5 23.3	35	1.3	95	3.6	155	5.8
36	5 39.0	5 39.9	5 23.6	36	1.4	96	3.6	156	5.9
37	5 39.3	5 40.2	5 23.8	37	1.4	97	3.6	157	5.9
38	5 39.5	5 40.4	5 24.0	38	1.4	98	3.7	158	5.9
39	5 39.8	5 40.7	5 24.3	39	1.5	99	3.7	159	6.0
40	5 40.0	5 40.9	5 24.5	40	1.5	100	3.8	160	6.0
41	5 40.3	5 41.2	5 24.7	41	1.5	101	3.8	161	6.0
42	5 40.5	5 41.4	5 25.0	42	1.6	102	3.8	162	6.1
43	5 40.8	5 41.7	5 25.2	43	1.6	103	3.9	163	6.1
44	5 41.0	5 41.9	5 25.5	44	1.7	104	3.9	164	6.2
45	5 41.3	5 42.2	5 25.7	45	1.7	105	3.9	165	6.2
46	5 41.5	5 42.4	5 25.9	46	1.7	106	4.0	166	6.2
47	5 41.8	5 42.7	5 26.2	47	1.8	107	4.0	167	6.3
48	5 42.0	5 42.9	5 26.4	48	1.8	108	4.1	168	6.3
49	5 42.3	5 43.2	5 26.7	49	1.8	109	4.1	169	6.3
50	5 42.5	5 43.4	5 26.9	50	1.9	110	4.1	170	6.4
51	5 42.8	5 43.7	5 27.1	51	1.9	111	4.2	171	6.4
52	5 43.0	5 43.9	5 27.4	52	2.0	112	4.2	172	6.5
53	5 43.3	5 44.2	5 27.6	53	2.0	113	4.2	173	6.5
54	5 43.5	5 44.4	5 27.9	54	2.0	114	4.3	174	6.5
55	5 43.8	5 44.7	5 28.1	55	2.1	115	4.3	175	6.6
56	5 44.0	5 44.9	5 28.3	56	2.1	116	4.4	176	6.6
57	5 44.3	5 45.2	5 28.6	57	2.1	117	4.4	177	6.6
58	5 44.5	5 45.4	5 28.8	58	2.2	118	4.4	178	6.7
59	5 44.8	5 45.7	5 29.0	59	2.2	119	4.5	179	6.7
60	5 45.0	5 45.9	5 29.3	60	2.3	120	4.5	180	6.8

23m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	5 45.0	5 45.9	5 29.3	0	0.0	60	2.4	120	4.7
1	5 45.3	5 46.2	5 29.5	1	0.0	61	2.4	121	4.7
2	5 45.5	5 46.4	5 29.8	2	0.1	62	2.4	122	4.8
3	5 45.8	5 46.7	5 30.0	3	0.1	63	2.5	123	4.8
4	5 46.0	5 46.9	5 30.2	4	0.2	64	2.5	124	4.9
5	5 46.3	5 47.2	5 30.5	5	0.2	65	2.5	125	4.9
6	5 46.5	5 47.4	5 30.7	6	0.2	66	2.6	126	4.9
7	5 46.8	5 47.7	5 31.0	7	0.3	67	2.6	127	5.0
8	5 47.0	5 48.0	5 31.2	8	0.3	68	2.7	128	5.0
9	5 47.3	5 48.2	5 31.4	9	0.4	69	2.7	129	5.1
10	5 47.5	5 48.5	5 31.7	10	0.4	70	2.7	130	5.1
11	5 47.8	5 48.7	5 31.9	11	0.4	71	2.8	131	5.1
12	5 48.0	5 49.0	5 32.1	12	0.5	72	2.8	132	5.2
13	5 48.3	5 49.2	5 32.4	13	0.5	73	2.9	133	5.2
14	5 48.5	5 49.5	5 32.6	14	0.5	74	2.9	134	5.2
15	5 48.8	5 49.7	5 32.9	15	0.6	75	2.9	135	5.3
16	5 49.0	5 50.0	5 33.1	16	0.6	76	3.0	136	5.3
17	5 49.3	5 50.2	5 33.3	17	0.7	77	3.0	137	5.4
18	5 49.5	5 50.5	5 33.6	18	0.7	78	3.1	138	5.4
19	5 49.8	5 50.7	5 33.8	19	0.7	79	3.1	139	5.4
20	5 50.0	5 51.0	5 34.1	20	0.8	80	3.1	140	5.5
21	5 50.3	5 51.2	5 34.3	21	0.8	81	3.2	141	5.5
22	5 50.5	5 51.5	5 34.5	22	0.9	82	3.2	142	5.6
23	5 50.8	5 51.7	5 34.8	23	0.9	83	3.3	143	5.6
24	5 51.0	5 52.0	5 35.0	24	0.9	84	3.3	144	5.6
25	5 51.3	5 52.2	5 35.2	25	1.0	85	3.3	145	5.7
26	5 51.5	5 52.5	5 35.5	26	1.0	86	3.4	146	5.7
27	5 51.8	5 52.7	5 35.7	27	1.1	87	3.4	147	5.8
28	5 52.0	5 53.0	5 36.0	28	1.1	88	3.4	148	5.8
29	5 52.3	5 53.2	5 36.2	29	1.1	89	3.5	149	5.8
30	5 52.5	5 53.5	5 36.4	30	1.2	90	3.5	150	5.9
31	5 52.8	5 53.7	5 36.7	31	1.2	91	3.6	151	5.9
32	5 53.0	5 54.0	5 36.9	32	1.3	92	3.6	152	6.0
33	5 53.3	5 54.2	5 37.2	33	1.3	93	3.6	153	6.0
34	5 53.5	5 54.5	5 37.4	34	1.3	94	3.7	154	6.0
35	5 53.8	5 54.7	5 37.6	35	1.4	95	3.7	155	6.1
36	5 54.0	5 55.0	5 37.9	36	1.4	96	3.8	156	6.1
37	5 54.3	5 55.2	5 38.1	37	1.4	97	3.8	157	6.1
38	5 54.5	5 55.5	5 38.4	38	1.5	98	3.8	158	6.2
39	5 54.8	5 55.7	5 38.6	39	1.5	99	3.9	159	6.2
40	5 55.0	5 56.0	5 38.8	40	1.6	100	3.9	160	6.3
41	5 55.3	5 56.2	5 39.1	41	1.6	101	4.0	161	6.3
42	5 55.5	5 56.5	5 39.3	42	1.6	102	4.0	162	6.3
43	5 55.8	5 56.7	5 39.5	43	1.7	103	4.0	163	6.4
44	5 56.0	5 57.0	5 39.8	44	1.7	104	4.1	164	6.4
45	5 56.3	5 57.2	5 40.0	45	1.8	105	4.1	165	6.5
46	5 56.5	5 57.5	5 40.3	46	1.8	106	4.2	166	6.5
47	5 56.8	5 57.7	5 40.5	47	1.8	107	4.2	167	6.5
48	5 57.0	5 58.0	5 40.7	48	1.9	108	4.2	168	6.6
49	5 57.3	5 58.2	5 41.0	49	1.9	109	4.3	169	6.6
50	5 57.5	5 58.5	5 41.2	50	2.0	110	4.3	170	6.7
51	5 57.8	5 58.7	5 41.5	51	2.0	111	4.3	171	6.7
52	5 58.0	5 59.0	5 41.7	52	2.0	112	4.4	172	6.7
53	5 58.3	5 59.2	5 41.9	53	2.1	113	4.4	173	6.8
54	5 58.5	5 59.5	5 42.2	54	2.1	114	4.5	174	6.8
55	5 58.8	5 59.7	5 42.4	55	2.2	115	4.5	175	6.9
56	5 59.0	6 00.0	5 42.6	56	2.2	116	4.5	176	6.9
57	5 59.3	6 00.2	5 42.9	57	2.2	117	4.6	177	6.9
58	5 59.5	6 00.5	5 43.1	58	2.3	118	4.6	178	7.0
59	5 59.8	6 00.7	5 43.4	59	2.3	119	4.7	179	7.0
60	6 00.0	6 01.0	5 43.6	60	2.4	120	4.7	180	7.1

24m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	6 00.0	6 01.0	5 43.6	0	0.0	60	2.5	120	4.9
1	6 00.3	6 01.2	5 43.8	1	0.0	61	2.5	121	4.9
2	6 00.5	6 01.5	5 44.1	2	0.1	62	2.5	122	5.0
3	6 00.8	6 01.7	5 44.3	3	0.1	63	2.6	123	5.0
4	6 01.0	6 02.0	5 44.6	4	0.2	64	2.6	124	5.1
5	6 01.3	6 02.2	5 44.8	5	0.2	65	2.7	125	5.1
6	6 01.5	6 02.5	5 45.0	6	0.2	66	2.7	126	5.1
7	6 01.8	6 02.7	5 45.3	7	0.3	67	2.7	127	5.2
8	6 02.0	6 03.0	5 45.5	8	0.3	68	2.8	128	5.2
9	6 02.3	6 03.2	5 45.7	9	0.4	69	2.8	129	5.3
10	6 02.5	6 03.5	5 46.0	10	0.4	70	2.9	130	5.3
11	6 02.8	6 03.7	5 46.2	11	0.4	71	2.9	131	5.3
12	6 03.0	6 04.0	5 46.5	12	0.5	72	2.9	132	5.4
13	6 03.3	6 04.2	5 46.7	13	0.5	73	3.0	133	5.4
14	6 03.5	6 04.5	5 46.9	14	0.6	74	3.0	134	5.5
15	6 03.8	6 04.7	5 47.2	15	0.6	75	3.1	135	5.5
16	6 04.0	6 05.0	5 47.4	16	0.7	76	3.1	136	5.6
17	6 04.3	6 05.2	5 47.7	17	0.7	77	3.1	137	5.6
18	6 04.5	6 05.5	5 47.9	18	0.7	78	3.2	138	5.6
19	6 04.8	6 05.7	5 48.1	19	0.8	79	3.2	139	5.7
20	6 05.0	6 06.0	5 48.4	20	0.8	80	3.3	140	5.7
21	6 05.3	6 06.3	5 48.6	21	0.9	81	3.3	141	5.8
22	6 05.5	6 06.5	5 48.8	22	0.9	82	3.3	142	5.8
23	6 05.8	6 06.8	5 49.1	23	0.9	83	3.4	143	5.8
24	6 06.0	6 07.0	5 49.3	24	1.0	84	3.4	144	5.9
25	6 06.3	6 07.3	5 49.6	25	1.0	85	3.5	145	5.9
26	6 06.5	6 07.5	5 49.8	26	1.1	86	3.5	146	6.0
27	6 06.8	6 07.8	5 50.0	27	1.1	87	3.6	147	6.0
28	6 07.0	6 08.0	5 50.3	28	1.1	88	3.6	148	6.0
29	6 07.3	6 08.3	5 50.5	29	1.2	89	3.6	149	6.1
30	6 07.5	6 08.5	5 50.8	30	1.2	90	3.7	150	6.1
31	6 07.8	6 08.8	5 51.0	31	1.3	91	3.7	151	6.2
32	6 08.0	6 09.0	5 51.2	32	1.3	92	3.8	152	6.2
33	6 08.3	6 09.3	5 51.5	33	1.3	93	3.8	153	6.2
34	6 08.5	6 09.5	5 51.7	34	1.4	94	3.8	154	6.3
35	6 08.8	6 09.8	5 52.0	35	1.4	95	3.9	155	6.3
36	6 09.0	6 10.0	5 52.2	36	1.5	96	3.9	156	6.4
37	6 09.3	6 10.3	5 52.4	37	1.5	97	4.0	157	6.4
38	6 09.5	6 10.5	5 52.7	38	1.6	98	4.0	158	6.5
39	6 09.8	6 10.8	5 52.9	39	1.6	99	4.0	159	6.5
40	6 10.0	6 11.0	5 53.1	40	1.6	100	4.1	160	6.5
41	6 10.3	6 11.3	5 53.4	41	1.7	101	4.1	161	6.6
42	6 10.5	6 11.5	5 53.6	42	1.7	102	4.2	162	6.6
43	6 10.8	6 11.8	5 53.9	43	1.8	103	4.2	163	6.7
44	6 11.0	6 12.0	5 54.1	44	1.8	104	4.2	164	6.7
45	6 11.3	6 12.3	5 54.3	45	1.8	105	4.3	165	6.7
46	6 11.5	6 12.5	5 54.6	46	1.9	106	4.3	166	6.8
47	6 11.8	6 12.8	5 54.8	47	1.9	107	4.4	167	6.8
48	6 12.0	6 13.0	5 55.1	48	2.0	108	4.4	168	6.9
49	6 12.3	6 13.3	5 55.3	49	2.0	109	4.5	169	6.9
50	6 12.5	6 13.5	5 55.5	50	2.0	110	4.5	170	6.9
51	6 12.8	6 13.8	5 55.8	51	2.1	111	4.5	171	7.0
52	6 13.0	6 14.0	5 56.0	52	2.1	112	4.6	172	7.0
53	6 13.3	6 14.3	5 56.2	53	2.2	113	4.6	173	7.1
54	6 13.5	6 14.5	5 56.5	54	2.2	114	4.7	174	7.1
55	6 13.8	6 14.8	5 56.7	55	2.2	115	4.7	175	7.1
56	6 14.0	6 15.0	5 57.0	56	2.3	116	4.7	176	7.2
57	6 14.3	6 15.3	5 57.2	57	2.3	117	4.8	177	7.2
58	6 14.5	6 15.5	5 57.4	58	2.4	118	4.8	178	7.3
59	6 14.8	6 15.8	5 57.7	59	2.4	119	4.9	179	7.3
60	6 15.0	6 16.0	5 57.9	60	2.5	120	4.9	180	7.4

25m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	6 15.0	6 16.0	5 57.9	0	0.0	60	2.6	120	5.1
1	6 15.3	6 16.3	5 58.2	1	0.0	61	2.6	121	5.1
2	6 15.5	6 16.5	5 58.4	2	0.1	62	2.6	122	5.2
3	6 15.8	6 16.8	5 58.6	3	0.1	63	2.7	123	5.2
4	6 16.0	6 17.0	5 58.9	4	0.2	64	2.7	124	5.3
5	6 16.3	6 17.3	5 59.1	5	0.2	65	2.8	125	5.3
6	6 16.5	6 17.5	5 59.3	6	0.3	66	2.8	126	5.4
7	6 16.8	6 17.8	5 59.6	7	0.3	67	2.8	127	5.4
8	6 17.0	6 18.0	5 59.8	8	0.3	68	2.9	128	5.4
9	6 17.3	6 18.3	6 00.1	9	0.4	69	2.9	129	5.5
10	6 17.5	6 18.5	6 00.3	10	0.4	70	3.0	130	5.5
11	6 17.8	6 18.8	6 00.5	11	0.5	71	3.0	131	5.6
12	6 18.0	6 19.0	6 00.8	12	0.5	72	3.1	132	5.6
13	6 18.3	6 19.3	6 01.0	13	0.6	73	3.1	133	5.7
14	6 18.5	6 19.5	6 01.3	14	0.6	74	3.1	134	5.7
15	6 18.8	6 19.8	6 01.5	15	0.6	75	3.2	135	5.7
16	6 19.0	6 20.0	6 01.7	16	0.7	76	3.2	136	5.8
17	6 19.3	6 20.3	6 02.0	17	0.7	77	3.3	137	5.8
18	6 19.5	6 20.5	6 02.2	18	0.8	78	3.3	138	5.9
19	6 19.8	6 20.8	6 02.5	19	0.8	79	3.4	139	5.9
20	6 20.0	6 21.0	6 02.7	20	0.9	80	3.4	140	6.0
21	6 20.3	6 21.3	6 02.9	21	0.9	81	3.4	141	6.0
22	6 20.5	6 21.5	6 03.2	22	0.9	82	3.5	142	6.0
23	6 20.8	6 21.8	6 03.4	23	1.0	83	3.5	143	6.1
24	6 21.0	6 22.0	6 03.6	24	1.0	84	3.6	144	6.1
25	6 21.3	6 22.3	6 03.9	25	1.1	85	3.6	145	6.2
26	6 21.5	6 22.5	6 04.1	26	1.1	86	3.7	146	6.2
27	6 21.8	6 22.8	6 04.4	27	1.1	87	3.7	147	6.2
28	6 22.0	6 23.0	6 04.6	28	1.2	88	3.7	148	6.3
29	6 22.3	6 23.3	6 04.8	29	1.2	89	3.8	149	6.3
30	6 22.5	6 23.5	6 05.1	30	1.3	90	3.8	150	6.4
31	6 22.8	6 23.8	6 05.3	31	1.3	91	3.9	151	6.4
32	6 23.0	6 24.0	6 05.6	32	1.4	92	3.9	152	6.5
33	6 23.3	6 24.3	6 05.8	33	1.4	93	4.0	153	6.5
34	6 23.5	6 24.5	6 06.0	34	1.4	94	4.0	154	6.5
35	6 23.8	6 24.8	6 06.3	35	1.5	95	4.0	155	6.6
36	6 24.0	6 25.1	6 06.5	36	1.5	96	4.1	156	6.6
37	6 24.3	6 25.3	6 06.7	37	1.6	97	4.1	157	6.7
38	6 24.5	6 25.6	6 07.0	38	1.6	98	4.2	158	6.7
39	6 24.8	6 25.8	6 07.2	39	1.7	99	4.2	159	6.8
40	6 25.0	6 26.1	6 07.5	40	1.7	100	4.3	160	6.8
41	6 25.3	6 26.3	6 07.7	41	1.7	101	4.3	161	6.8
42	6 25.5	6 26.6	6 07.9	42	1.8	102	4.3	162	6.9
43	6 25.8	6 26.8	6 08.2	43	1.8	103	4.4	163	6.9
44	6 26.0	6 27.1	6 08.4	44	1.9	104	4.4	164	7.0
45	6 26.3	6 27.3	6 08.7	45	1.9	105	4.5	165	7.0
46	6 26.5	6 27.6	6 08.9	46	2.0	106	4.5	166	7.1
47	6 26.8	6 27.8	6 09.1	47	2.0	107	4.5	167	7.1
48	6 27.0	6 28.1	6 09.4	48	2.0	108	4.6	168	7.1
49	6 27.3	6 28.3	6 09.6	49	2.1	109	4.6	169	7.2
50	6 27.5	6 28.6	6 09.8	50	2.1	110	4.7	170	7.2
51	6 27.8	6 28.8	6 10.1	51	2.2	111	4.7	171	7.3
52	6 28.0	6 29.1	6 10.3	52	2.2	112	4.8	172	7.3
53	6 28.3	6 29.3	6 10.6	53	2.3	113	4.8	173	7.4
54	6 28.5	6 29.6	6 10.8	54	2.3	114	4.8	174	7.4
55	6 28.8	6 29.8	6 11.0	55	2.3	115	4.9	175	7.4
56	6 29.0	6 30.1	6 11.3	56	2.4	116	4.9	176	7.5
57	6 29.3	6 30.3	6 11.5	57	2.4	117	5.0	177	7.5
58	6 29.5	6 30.6	6 11.8	58	2.5	118	5.0	178	7.6
59	6 29.8	6 30.8	6 12.0	59	2.5	119	5.1	179	7.6
60	6 30.0	6 31.1	6 12.2	60	2.6	120	5.1	180	7.7

26m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	6 30.0	6 31.1	6 12.2	0	0.0	60	2.7	120	5.3
1	6 30.3	6 31.3	6 12.5	1	0.0	61	2.7	121	5.3
2	6 30.5	6 31.6	6 12.7	2	0.1	62	2.7	122	5.4
3	6 30.8	6 31.8	6 12.9	3	0.1	63	2.8	123	5.4
4	6 31.0	6 32.1	6 13.2	4	0.2	64	2.8	124	5.5
5	6 31.3	6 32.3	6 13.4	5	0.2	65	2.9	125	5.5
6	6 31.5	6 32.6	6 13.7	6	0.3	66	2.9	126	5.6
7	6 31.8	6 32.8	6 13.9	7	0.3	67	3.0	127	5.6
8	6 32.0	6 33.1	6 14.1	8	0.4	68	3.0	128	5.7
9	6 32.3	6 33.3	6 14.4	9	0.4	69	3.0	129	5.7
10	6 32.5	6 33.6	6 14.6	10	0.4	70	3.1	130	5.7
11	6 32.8	6 33.8	6 14.9	11	0.5	71	3.1	131	5.8
12	6 33.0	6 34.1	6 15.1	12	0.5	72	3.2	132	5.8
13	6 33.3	6 34.3	6 15.3	13	0.6	73	3.2	133	5.9
14	6 33.5	6 34.6	6 15.6	14	0.6	74	3.3	134	5.9
15	6 33.8	6 34.8	6 15.8	15	0.7	75	3.3	135	6.0
16	6 34.0	6 35.1	6 16.1	16	0.7	76	3.4	136	6.0
17	6 34.3	6 35.3	6 16.3	17	0.8	77	3.4	137	6.1
18	6 34.5	6 35.6	6 16.5	18	0.8	78	3.4	138	6.1
19	6 34.8	6 35.8	6 16.8	19	0.8	79	3.5	139	6.1
20	6 35.0	6 36.1	6 17.0	20	0.9	80	3.5	140	6.2
21	6 35.3	6 36.3	6 17.2	21	0.9	81	3.6	141	6.2
22	6 35.5	6 36.6	6 17.5	22	1.0	82	3.6	142	6.3
23	6 35.8	6 36.8	6 17.7	23	1.0	83	3.7	143	6.3
24	6 36.0	6 37.1	6 18.0	24	1.1	84	3.7	144	6.4
25	6 36.3	6 37.3	6 18.2	25	1.1	85	3.8	145	6.4
26	6 36.5	6 37.6	6 18.4	26	1.1	86	3.8	146	6.4
27	6 36.8	6 37.8	6 18.7	27	1.2	87	3.8	147	6.5
28	6 37.0	6 38.1	6 18.9	28	1.2	88	3.9	148	6.5
29	6 37.3	6 38.3	6 19.2	29	1.3	89	3.9	149	6.6
30	6 37.5	6 38.6	6 19.4	30	1.3	90	4.0	150	6.6
31	6 37.8	6 38.8	6 19.6	31	1.4	91	4.0	151	6.7
32	6 38.0	6 39.1	6 19.9	32	1.4	92	4.1	152	6.7
33	6 38.3	6 39.3	6 20.1	33	1.5	93	4.1	153	6.8
34	6 38.5	6 39.6	6 20.3	34	1.5	94	4.2	154	6.8
35	6 38.8	6 39.8	6 20.6	35	1.5	95	4.2	155	6.8
36	6 39.0	6 40.1	6 20.8	36	1.6	96	4.2	156	6.9
37	6 39.3	6 40.3	6 21.1	37	1.6	97	4.3	157	6.9
38	6 39.5	6 40.6	6 21.3	38	1.7	98	4.3	158	7.0
39	6 39.8	6 40.8	6 21.5	39	1.7	99	4.4	159	7.0
40	6 40.0	6 41.1	6 21.8	40	1.8	100	4.4	160	7.1
41	6 40.3	6 41.3	6 22.0	41	1.8	101	4.5	161	7.1
42	6 40.5	6 41.6	6 22.3	42	1.9	102	4.5	162	7.2
43	6 40.8	6 41.8	6 22.5	43	1.9	103	4.5	163	7.2
44	6 41.0	6 42.1	6 22.7	44	1.9	104	4.6	164	7.2
45	6 41.3	6 42.3	6 23.0	45	2.0	105	4.6	165	7.3
46	6 41.5	6 42.6	6 23.2	46	2.0	106	4.7	166	7.3
47	6 41.8	6 42.8	6 23.4	47	2.1	107	4.7	167	7.4
48	6 42.0	6 43.1	6 23.7	48	2.1	108	4.8	168	7.4
49	6 42.3	6 43.4	6 23.9	49	2.2	109	4.8	169	7.5
50	6 42.5	6 43.6	6 24.2	50	2.2	110	4.9	170	7.5
51	6 42.8	6 43.9	6 24.4	51	2.3	111	4.9	171	7.6
52	6 43.0	6 44.1	6 24.6	52	2.3	112	4.9	172	7.6
53	6 43.3	6 44.4	6 24.9	53	2.3	113	5.0	173	7.6
54	6 43.5	6 44.6	6 25.1	54	2.4	114	5.0	174	7.7
55	6 43.8	6 44.9	6 25.4	55	2.4	115	5.1	175	7.7
56	6 44.0	6 45.1	6 25.6	56	2.5	116	5.1	176	7.8
57	6 44.3	6 45.4	6 25.8	57	2.5	117	5.2	177	7.8
58	6 44.5	6 45.6	6 26.1	58	2.6	118	5.2	178	7.9
59	6 44.8	6 45.9	6 26.3	59	2.6	119	5.3	179	7.9
60	6 45.0	6 46.1	6 26.6	60	2.7	120	5.3	180	8.0

27m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	6 45.0	6 46.1	6 26.6	0	0.0	60	2.8	120	5.5
1	6 45.3	6 46.4	6 26.8	1	0.0	61	2.8	121	5.5
2	6 45.5	6 46.6	6 27.0	2	0.1	62	2.8	122	5.6
3	6 45.8	6 46.9	6 27.3	3	0.1	63	2.9	123	5.6
4	6 46.0	6 47.1	6 27.5	4	0.2	64	2.9	124	5.7
5	6 46.3	6 47.4	6 27.7	5	0.2	65	3.0	125	5.7
6	6 46.5	6 47.6	6 28.0	6	0.3	66	3.0	126	5.8
7	6 46.8	6 47.9	6 28.2	7	0.3	67	3.1	127	5.8
8	6 47.0	6 48.1	6 28.5	8	0.4	68	3.1	128	5.9
9	6 47.3	6 48.4	6 28.7	9	0.4	69	3.2	129	5.9
10	6 47.5	6 48.6	6 28.9	10	0.5	70	3.2	130	6.0
11	6 47.8	6 48.9	6 29.2	11	0.5	71	3.3	131	6.0
12	6 48.0	6 49.1	6 29.4	12	0.6	72	3.3	132	6.1
13	6 48.3	6 49.4	6 29.7	13	0.6	73	3.3	133	6.1
14	6 48.5	6 49.6	6 29.9	14	0.6	74	3.4	134	6.1
15	6 48.8	6 49.9	6 30.1	15	0.7	75	3.4	135	6.2
16	6 49.0	6 50.1	6 30.4	16	0.7	76	3.5	136	6.2
17	6 49.3	6 50.4	6 30.6	17	0.8	77	3.5	137	6.3
18	6 49.5	6 50.6	6 30.8	18	0.8	78	3.6	138	6.3
19	6 49.8	6 50.9	6 31.1	19	0.9	79	3.6	139	6.4
20	6 50.0	6 51.1	6 31.3	20	0.9	80	3.7	140	6.4
21	6 50.3	6 51.4	6 31.6	21	1.0	81	3.7	141	6.5
22	6 50.5	6 51.6	6 31.8	22	1.0	82	3.8	142	6.5
23	6 50.8	6 51.9	6 32.0	23	1.1	83	3.8	143	6.6
24	6 51.0	6 52.1	6 32.3	24	1.1	84	3.9	144	6.6
25	6 51.3	6 52.4	6 32.5	25	1.1	85	3.9	145	6.6
26	6 51.5	6 52.6	6 32.8	26	1.2	86	3.9	146	6.7
27	6 51.8	6 52.9	6 33.0	27	1.2	87	4.0	147	6.7
28	6 52.0	6 53.1	6 33.2	28	1.3	88	4.0	148	6.8
29	6 52.3	6 53.4	6 33.5	29	1.3	89	4.1	149	6.8
30	6 52.5	6 53.6	6 33.7	30	1.4	90	4.1	150	6.9
31	6 52.8	6 53.9	6 33.9	31	1.4	91	4.2	151	6.9
32	6 53.0	6 54.1	6 34.2	32	1.5	92	4.2	152	7.0
33	6 53.3	6 54.4	6 34.4	33	1.5	93	4.3	153	7.0
34	6 53.5	6 54.6	6 34.7	34	1.6	94	4.3	154	7.1
35	6 53.8	6 54.9	6 34.9	35	1.6	95	4.4	155	7.1
36	6 54.0	6 55.1	6 35.1	36	1.7	96	4.4	156	7.2
37	6 54.3	6 55.4	6 35.4	37	1.7	97	4.4	157	7.2
38	6 54.5	6 55.6	6 35.6	38	1.7	98	4.5	158	7.2
39	6 54.8	6 55.9	6 35.9	39	1.8	99	4.5	159	7.3
40	6 55.0	6 56.1	6 36.1	40	1.8	100	4.6	160	7.3
41	6 55.3	6 56.4	6 36.3	41	1.9	101	4.6	161	7.4
42	6 55.5	6 56.6	6 36.6	42	1.9	102	4.7	162	7.4
43	6 55.8	6 56.9	6 36.8	43	2.0	103	4.7	163	7.5
44	6 56.0	6 57.1	6 37.0	44	2.0	104	4.8	164	7.5
45	6 56.3	6 57.4	6 37.3	45	2.1	105	4.8	165	7.6
46	6 56.5	6 57.6	6 37.5	46	2.1	106	4.9	166	7.6
47	6 56.8	6 57.9	6 37.8	47	2.2	107	4.9	167	7.7
48	6 57.0	6 58.1	6 38.0	48	2.2	108	5.0	168	7.7
49	6 57.3	6 58.4	6 38.2	49	2.2	109	5.0	169	7.7
50	6 57.5	6 58.6	6 38.5	50	2.3	110	5.0	170	7.8
51	6 57.8	6 58.9	6 38.7	51	2.3	111	5.1	171	7.8
52	6 58.0	6 59.1	6 39.0	52	2.4	112	5.1	172	7.9
53	6 58.3	6 59.4	6 39.2	53	2.4	113	5.2	173	7.9
54	6 58.5	6 59.6	6 39.4	54	2.5	114	5.2	174	8.0
55	6 58.8	6 59.9	6 39.7	55	2.5	115	5.3	175	8.0
56	6 59.0	7 00.1	6 39.9	56	2.6	116	5.3	176	8.1
57	6 59.3	7 00.4	6 40.2	57	2.6	117	5.4	177	8.1
58	6 59.5	7 00.6	6 40.4	58	2.7	118	5.4	178	8.2
59	6 59.8	7 00.9	6 40.6	59	2.7	119	5.5	179	8.2
60	7 00.0	7 01.1	6 40.9	60	2.8	120	5.5	180	8.3

28m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	7 00.0	7 01.1	6 40.9	0	0.0	60	2.9	120	5.7
1	7 00.3	7 01.4	6 41.1	1	0.0	61	2.9	121	5.7
2	7 00.5	7 01.7	6 41.3	2	0.1	62	2.9	122	5.8
3	7 00.8	7 01.9	6 41.6	3	0.1	63	3.0	123	5.8
4	7 01.0	7 02.2	6 41.8	4	0.2	64	3.0	124	5.9
5	7 01.3	7 02.4	6 42.1	5	0.2	65	3.1	125	5.9
6	7 01.5	7 02.7	6 42.3	6	0.3	66	3.1	126	6.0
7	7 01.8	7 02.9	6 42.5	7	0.3	67	3.2	127	6.0
8	7 02.0	7 03.2	6 42.8	8	0.4	68	3.2	128	6.1
9	7 02.3	7 03.4	6 43.0	9	0.4	69	3.3	129	6.1
10	7 02.5	7 03.7	6 43.3	10	0.5	70	3.3	130	6.2
11	7 02.8	7 03.9	6 43.5	11	0.5	71	3.4	131	6.2
12	7 03.0	7 04.2	6 43.7	12	0.6	72	3.4	132	6.3
13	7 03.3	7 04.4	6 44.0	13	0.6	73	3.5	133	6.3
14	7 03.5	7 04.7	6 44.2	14	0.7	74	3.5	134	6.4
15	7 03.8	7 04.9	6 44.4	15	0.7	75	3.6	135	6.4
16	7 04.0	7 05.2	6 44.7	16	0.8	76	3.6	136	6.5
17	7 04.3	7 05.4	6 44.9	17	0.8	77	3.7	137	6.5
18	7 04.5	7 05.7	6 45.2	18	0.9	78	3.7	138	6.6
19	7 04.8	7 05.9	6 45.4	19	0.9	79	3.8	139	6.6
20	7 05.0	7 06.2	6 45.6	20	1.0	80	3.8	140	6.7
21	7 05.3	7 06.4	6 45.9	21	1.0	81	3.8	141	6.7
22	7 05.5	7 06.7	6 46.1	22	1.0	82	3.9	142	6.7
23	7 05.8	7 06.9	6 46.4	23	1.1	83	3.9	143	6.8
24	7 06.0	7 07.2	6 46.6	24	1.1	84	4.0	144	6.8
25	7 06.3	7 07.4	6 46.8	25	1.2	85	4.0	145	6.9
26	7 06.5	7 07.7	6 47.1	26	1.2	86	4.1	146	6.9
27	7 06.8	7 07.9	6 47.3	27	1.3	87	4.1	147	7.0
28	7 07.0	7 08.2	6 47.5	28	1.3	88	4.2	148	7.0
29	7 07.3	7 08.4	6 47.8	29	1.4	89	4.2	149	7.1
30	7 07.5	7 08.7	6 48.0	30	1.4	90	4.3	150	7.1
31	7 07.8	7 08.9	6 48.3	31	1.5	91	4.3	151	7.2
32	7 08.0	7 09.2	6 48.5	32	1.5	92	4.4	152	7.2
33	7 08.3	7 09.4	6 48.7	33	1.6	93	4.4	153	7.3
34	7 08.5	7 09.7	6 49.0	34	1.6	94	4.5	154	7.3
35	7 08.8	7 09.9	6 49.2	35	1.7	95	4.5	155	7.4
36	7 09.0	7 10.2	6 49.5	36	1.7	96	4.6	156	7.4
37	7 09.3	7 10.4	6 49.7	37	1.8	97	4.6	157	7.5
38	7 09.5	7 10.7	6 49.9	38	1.8	98	4.7	158	7.5
39	7 09.8	7 10.9	6 50.2	39	1.9	99	4.7	159	7.6
40	7 10.0	7 11.2	6 50.4	40	1.9	100	4.8	160	7.6
41	7 10.3	7 11.4	6 50.6	41	1.9	101	4.8	161	7.6
42	7 10.5	7 11.7	6 50.9	42	2.0	102	4.8	162	7.7
43	7 10.8	7 11.9	6 51.1	43	2.0	103	4.9	163	7.7
44	7 11.0	7 12.2	6 51.4	44	2.1	104	4.9	164	7.8
45	7 11.3	7 12.4	6 51.6	45	2.1	105	5.0	165	7.8
46	7 11.5	7 12.7	6 51.8	46	2.2	106	5.0	166	7.9
47	7 11.8	7 12.9	6 52.1	47	2.2	107	5.1	167	7.9
48	7 12.0	7 13.2	6 52.3	48	2.3	108	5.1	168	8.0
49	7 12.3	7 13.4	6 52.6	49	2.3	109	5.2	169	8.0
50	7 12.5	7 13.7	6 52.8	50	2.4	110	5.2	170	8.1
51	7 12.8	7 13.9	6 53.0	51	2.4	111	5.3	171	8.1
52	7 13.0	7 14.2	6 53.3	52	2.5	112	5.3	172	8.2
53	7 13.3	7 14.4	6 53.5	53	2.5	113	5.4	173	8.2
54	7 13.5	7 14.7	6 53.8	54	2.6	114	5.4	174	8.3
55	7 13.8	7 14.9	6 54.0	55	2.6	115	5.5	175	8.3
56	7 14.0	7 15.2	6 54.2	56	2.7	116	5.5	176	8.4
57	7 14.3	7 15.4	6 54.5	57	2.7	117	5.6	177	8.4
58	7 14.5	7 15.7	6 54.7	58	2.8	118	5.6	178	8.5
59	7 14.8	7 15.9	6 54.9	59	2.8	119	5.7	179	8.5
60	7 15.0	7 16.2	6 55.2	60	2.9	120	5.7	180	8.6

29m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	7 15.0	7 16.2	6 55.2	0	0.0	60	3.0	120	5.9
1	7 15.3	7 16.4	6 55.4	1	0.0	61	3.0	121	5.9
2	7 15.5	7 16.7	6 55.7	2	0.1	62	3.0	122	6.0
3	7 15.8	7 16.9	6 55.9	3	0.1	63	3.1	123	6.0
4	7 16.0	7 17.2	6 56.1	4	0.2	64	3.1	124	6.1
5	7 16.3	7 17.4	6 56.4	5	0.2	65	3.2	125	6.1
6	7 16.5	7 17.7	6 56.6	6	0.3	66	3.2	126	6.2
7	7 16.8	7 17.9	6 56.9	7	0.3	67	3.3	127	6.2
8	7 17.0	7 18.2	6 57.1	8	0.4	68	3.3	128	6.3
9	7 17.3	7 18.4	6 57.3	9	0.4	69	3.4	129	6.3
10	7 17.5	7 18.7	6 57.6	10	0.5	70	3.4	130	6.4
11	7 17.8	7 18.9	6 57.8	11	0.5	71	3.5	131	6.4
12	7 18.0	7 19.2	6 58.0	12	0.6	72	3.5	132	6.5
13	7 18.3	7 19.4	6 58.3	13	0.6	73	3.6	133	6.5
14	7 18.5	7 19.7	6 58.5	14	0.7	74	3.6	134	6.6
15	7 18.8	7 20.0	6 58.8	15	0.7	75	3.7	135	6.6
16	7 19.0	7 20.2	6 59.0	16	0.8	76	3.7	136	6.7
17	7 19.3	7 20.5	6 59.2	17	0.8	77	3.8	137	6.7
18	7 19.5	7 20.7	6 59.5	18	0.9	78	3.8	138	6.8
19	7 19.8	7 21.0	6 59.7	19	0.9	79	3.9	139	6.8
20	7 20.0	7 21.2	7 00.0	20	1.0	80	3.9	140	6.9
21	7 20.3	7 21.5	7 00.2	21	1.0	81	4.0	141	6.9
22	7 20.5	7 21.7	7 00.4	22	1.1	82	4.0	142	7.0
23	7 20.8	7 22.0	7 00.7	23	1.1	83	4.1	143	7.0
24	7 21.0	7 22.2	7 00.9	24	1.2	84	4.1	144	7.1
25	7 21.3	7 22.5	7 01.1	25	1.2	85	4.2	145	7.1
26	7 21.5	7 22.7	7 01.4	26	1.3	86	4.2	146	7.2
27	7 21.8	7 23.0	7 01.6	27	1.3	87	4.3	147	7.2
28	7 22.0	7 23.2	7 01.9	28	1.4	88	4.3	148	7.3
29	7 22.3	7 23.5	7 02.1	29	1.4	89	4.4	149	7.3
30	7 22.5	7 23.7	7 02.3	30	1.5	90	4.4	150	7.4
31	7 22.8	7 24.0	7 02.6	31	1.5	91	4.5	151	7.4
32	7 23.0	7 24.2	7 02.8	32	1.6	92	4.5	152	7.5
33	7 23.3	7 24.5	7 03.1	33	1.6	93	4.6	153	7.5
34	7 23.5	7 24.7	7 03.3	34	1.7	94	4.6	154	7.6
35	7 23.8	7 25.0	7 03.5	35	1.7	95	4.7	155	7.6
36	7 24.0	7 25.2	7 03.8	36	1.8	96	4.7	156	7.7
37	7 24.3	7 25.5	7 04.0	37	1.8	97	4.8	157	7.7
38	7 24.5	7 25.7	7 04.3	38	1.9	98	4.8	158	7.8
39	7 24.8	7 26.0	7 04.5	39	1.9	99	4.9	159	7.8
40	7 25.0	7 26.2	7 04.7	40	2.0	100	4.9	160	7.9
41	7 25.3	7 26.5	7 05.0	41	2.0	101	5.0	161	7.9
42	7 25.5	7 26.7	7 05.2	42	2.1	102	5.0	162	8.0
43	7 25.8	7 27.0	7 05.4	43	2.1	103	5.1	163	8.0
44	7 26.0	7 27.2	7 05.7	44	2.2	104	5.1	164	8.1
45	7 26.3	7 27.5	7 05.9	45	2.2	105	5.2	165	8.1
46	7 26.5	7 27.7	7 06.2	46	2.3	106	5.2	166	8.2
47	7 26.8	7 28.0	7 06.4	47	2.3	107	5.3	167	8.2
48	7 27.0	7 28.2	7 06.6	48	2.4	108	5.3	168	8.3
49	7 27.3	7 28.5	7 06.9	49	2.4	109	5.4	169	8.3
50	7 27.5	7 28.7	7 07.1	50	2.5	110	5.4	170	8.4
51	7 27.8	7 29.0	7 07.4	51	2.5	111	5.5	171	8.4
52	7 28.0	7 29.2	7 07.6	52	2.6	112	5.5	172	8.5
53	7 28.3	7 29.5	7 07.8	53	2.6	113	5.6	173	8.5
54	7 28.5	7 29.7	7 08.1	54	2.7	114	5.6	174	8.6
55	7 28.8	7 30.0	7 08.3	55	2.7	115	5.7	175	8.6
56	7 29.0	7 30.2	7 08.5	56	2.8	116	5.7	176	8.7
57	7 29.3	7 30.5	7 08.8	57	2.8	117	5.8	177	8.7
58	7 29.5	7 30.7	7 09.0	58	2.9	118	5.8	178	8.8
59	7 29.8	7 31.0	7 09.3	59	2.9	119	5.9	179	8.8
60	7 30.0	7 31.2	7 09.5	60	3.0	120	5.9	180	8.9

30m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	7 30.0	7 31.2	7 09.5	0	0.0	60	3.1	120	6.1
1	7 30.3	7 31.5	7 09.7	1	0.1	61	3.1	121	6.2
2	7 30.5	7 31.7	7 10.0	2	0.1	62	3.2	122	6.2
3	7 30.8	7 32.0	7 10.2	3	0.2	63	3.2	123	6.3
4	7 31.0	7 32.2	7 10.5	4	0.2	64	3.3	124	6.3
5	7 31.3	7 32.5	7 10.7	5	0.3	65	3.3	125	6.4
6	7 31.5	7 32.7	7 10.9	6	0.3	66	3.4	126	6.4
7	7 31.8	7 33.0	7 11.2	7	0.4	67	3.4	127	6.5
8	7 32.0	7 33.2	7 11.4	8	0.4	68	3.5	128	6.5
9	7 32.3	7 33.5	7 11.6	9	0.5	69	3.5	129	6.6
10	7 32.5	7 33.7	7 11.9	10	0.5	70	3.6	130	6.6
11	7 32.8	7 34.0	7 12.1	11	0.6	71	3.6	131	6.7
12	7 33.0	7 34.2	7 12.4	12	0.6	72	3.7	132	6.7
13	7 33.3	7 34.5	7 12.6	13	0.7	73	3.7	133	6.8
14	7 33.5	7 34.7	7 12.8	14	0.7	74	3.8	134	6.8
15	7 33.8	7 35.0	7 13.1	15	0.8	75	3.8	135	6.9
16	7 34.0	7 35.2	7 13.3	16	0.8	76	3.9	136	6.9
17	7 34.3	7 35.5	7 13.6	17	0.9	77	3.9	137	7.0
18	7 34.5	7 35.7	7 13.8	18	0.9	78	4.0	138	7.0
19	7 34.8	7 36.0	7 14.0	19	1.0	79	4.0	139	7.1
20	7 35.0	7 36.2	7 14.3	20	1.0	80	4.1	140	7.1
21	7 35.3	7 36.5	7 14.5	21	1.1	81	4.1	141	7.2
22	7 35.5	7 36.7	7 14.7	22	1.1	82	4.2	142	7.2
23	7 35.8	7 37.0	7 15.0	23	1.2	83	4.2	143	7.3
24	7 36.0	7 37.2	7 15.2	24	1.2	84	4.3	144	7.3
25	7 36.3	7 37.5	7 15.5	25	1.3	85	4.3	145	7.4
26	7 36.5	7 37.7	7 15.7	26	1.3	86	4.4	146	7.4
27	7 36.8	7 38.0	7 15.9	27	1.4	87	4.4	147	7.5
28	7 37.0	7 38.3	7 16.2	28	1.4	88	4.5	148	7.5
29	7 37.3	7 38.5	7 16.4	29	1.5	89	4.5	149	7.6
30	7 37.5	7 38.8	7 16.7	30	1.5	90	4.6	150	7.6
31	7 37.8	7 39.0	7 16.9	31	1.6	91	4.6	151	7.7
32	7 38.0	7 39.3	7 17.1	32	1.6	92	4.7	152	7.7
33	7 38.3	7 39.5	7 17.4	33	1.7	93	4.7	153	7.8
34	7 38.5	7 39.8	7 17.6	34	1.7	94	4.8	154	7.8
35	7 38.8	7 40.0	7 17.9	35	1.8	95	4.8	155	7.9
36	7 39.0	7 40.3	7 18.1	36	1.8	96	4.9	156	7.9
37	7 39.3	7 40.5	7 18.3	37	1.9	97	4.9	157	8.0
38	7 39.5	7 40.8	7 18.6	38	1.9	98	5.0	158	8.0
39	7 39.8	7 41.0	7 18.8	39	2.0	99	5.0	159	8.1
40	7 40.0	7 41.3	7 19.0	40	2.0	100	5.1	160	8.1
41	7 40.3	7 41.5	7 19.3	41	2.1	101	5.1	161	8.2
42	7 40.5	7 41.8	7 19.5	42	2.1	102	5.2	162	8.2
43	7 40.8	7 42.0	7 19.8	43	2.2	103	5.2	163	8.3
44	7 41.0	7 42.3	7 20.0	44	2.2	104	5.3	164	8.3
45	7 41.3	7 42.5	7 20.2	45	2.3	105	5.3	165	8.4
46	7 41.5	7 42.8	7 20.5	46	2.3	106	5.4	166	8.4
47	7 41.8	7 43.0	7 20.7	47	2.4	107	5.4	167	8.5
48	7 42.0	7 43.3	7 21.0	48	2.4	108	5.5	168	8.5
49	7 42.3	7 43.5	7 21.2	49	2.5	109	5.5	169	8.6
50	7 42.5	7 43.8	7 21.4	50	2.5	110	5.6	170	8.6
51	7 42.8	7 44.0	7 21.7	51	2.6	111	5.6	171	8.7
52	7 43.0	7 44.3	7 21.9	52	2.6	112	5.7	172	8.7
53	7 43.3	7 44.5	7 22.1	53	2.7	113	5.7	173	8.8
54	7 43.5	7 44.8	7 22.4	54	2.7	114	5.8	174	8.8
55	7 43.8	7 45.0	7 22.6	55	2.8	115	5.8	175	8.9
56	7 44.0	7 45.3	7 22.9	56	2.8	116	5.9	176	8.9
57	7 44.3	7 45.5	7 23.1	57	2.9	117	5.9	177	9.0
58	7 44.5	7 45.8	7 23.3	58	2.9	118	6.0	178	9.0
59	7 44.8	7 46.0	7 23.6	59	3.0	119	6.0	179	9.1
60	7 45.0	7 46.3	7 23.8	60	3.1	120	6.1	180	9.2

31m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	7 45.0	7 46.3	7 23.8	0	0.0	60	3.2	120	6.3
1	7 45.3	7 46.5	7 24.1	1	0.1	61	3.2	121	6.4
2	7 45.5	7 46.8	7 24.3	2	0.1	62	3.3	122	6.4
3	7 45.8	7 47.0	7 24.5	3	0.2	63	3.3	123	6.5
4	7 46.0	7 47.3	7 24.8	4	0.2	64	3.4	124	6.5
5	7 46.3	7 47.5	7 25.0	5	0.3	65	3.4	125	6.6
6	7 46.5	7 47.8	7 25.2	6	0.3	66	3.5	126	6.6
7	7 46.8	7 48.0	7 25.5	7	0.4	67	3.5	127	6.7
8	7 47.0	7 48.3	7 25.7	8	0.4	68	3.6	128	6.7
9	7 47.3	7 48.5	7 26.0	9	0.5	69	3.6	129	6.8
10	7 47.5	7 48.8	7 26.2	10	0.5	70	3.7	130	6.8
11	7 47.8	7 49.0	7 26.4	11	0.6	71	3.7	131	6.9
12	7 48.0	7 49.3	7 26.7	12	0.6	72	3.8	132	6.9
13	7 48.3	7 49.5	7 26.9	13	0.7	73	3.8	133	7.0
14	7 48.5	7 49.8	7 27.2	14	0.7	74	3.9	134	7.0
15	7 48.8	7 50.0	7 27.4	15	0.8	75	3.9	135	7.1
16	7 49.0	7 50.3	7 27.6	16	0.8	76	4.0	136	7.1
17	7 49.3	7 50.5	7 27.9	17	0.9	77	4.0	137	7.2
18	7 49.5	7 50.8	7 28.1	18	0.9	78	4.1	138	7.2
19	7 49.8	7 51.0	7 28.4	19	1.0	79	4.1	139	7.3
20	7 50.0	7 51.3	7 28.6	20	1.1	80	4.2	140	7.4
21	7 50.3	7 51.5	7 28.8	21	1.1	81	4.3	141	7.4
22	7 50.5	7 51.8	7 29.1	22	1.2	82	4.3	142	7.5
23	7 50.8	7 52.0	7 29.3	23	1.2	83	4.4	143	7.5
24	7 51.0	7 52.3	7 29.5	24	1.3	84	4.4	144	7.6
25	7 51.3	7 52.5	7 29.8	25	1.3	85	4.5	145	7.6
26	7 51.5	7 52.8	7 30.0	26	1.4	86	4.5	146	7.7
27	7 51.8	7 53.0	7 30.3	27	1.4	87	4.6	147	7.7
28	7 52.0	7 53.3	7 30.5	28	1.5	88	4.6	148	7.8
29	7 52.3	7 53.5	7 30.7	29	1.5	89	4.7	149	7.8
30	7 52.5	7 53.8	7 31.0	30	1.6	90	4.7	150	7.9
31	7 52.8	7 54.0	7 31.2	31	1.6	91	4.8	151	7.9
32	7 53.0	7 54.3	7 31.5	32	1.7	92	4.8	152	8.0
33	7 53.3	7 54.5	7 31.7	33	1.7	93	4.9	153	8.0
34	7 53.5	7 54.8	7,31.9	34	1.8	94	4.9	154	8.1
35	7 53.8	7 55.0	7 32.2	35	1.8	95	5.0	155	8.1
36	7 54.0	7 55.3	7 32.4	36	1.9	96	5.0	156	8.2
37	7 54.3	7 55.5	7 32.6	37	1.9	97	5.1	157	8.2
38	7 54.5	7 55.8	7 32.9	38	2.0	98	5.1	158	8.3
39	7 54.8	7 56.0	7 33.1	39	2.0	99	5.2	159	8.3
40	7 55.0	7 56.3	7 33.4	40	2.1	100	5.3	160	8.4
41	7 55.3	7 56.6	7 33.6	41	2.2	101	5.3	161	8.5
42	7 55.5	7 56.8	7 33.8	42	2.2	102	5.4	162	8.5
43	7 55.8	7 57.1	7 34.1	43	2.3	103	5.4	163	8.6
44	7 56.0	7 57.3	7 34.3	44	2.3	104	5.5	164	8.6
45	7 56.3	7 57.6	7 34.6	45	2.4	105	5.5	165	8.7
46	7 56.5	7 57.8	7 34.8	46	2.4	106	5.6	166	8.7
47	7 56.8	7 58.1	7 35.0	47	2.5	107	5.6	167	8.8
48	7 57.0	7 58.3	7 35.3	48	2.5	108	5.7	168	8.8
49	7 57.3	7 58.6	7 35.5	49	2.6	109	5.7	169	8.9
50	7 57.5	7 58.8	7 35.7	50	2.6	110	5.8	170	8.9
51	7 57.8	7 59.1	7 36.0	51	2.7	111	5.8	171	9.0
52	7 58.0	7 59.3	7 36.2	52	2.7	112	5.9	172	9.0
53	7 58.3	7 59.6	7 36.5	53	2.8	113	5.9	173	9.1
54	7 58.5	7 59.8	7 36.7	54	2.8	114	6.0	174	9.1
55	7 58.8	8 00.1	7 36.9	55	2.9	115	6.0	175	9.2
56	7 59.0	8 00.3	7 37.2	56	2.9	116	6.1	176	9.2
57	7 59.3	8 00.6	7 37.4	57	3.0	117	6.1	177	9.3
58	7 59.5	8 00.8	7 37.7	58	3.0	118	6.2	178	9.3
59	7 59.8	8 01.1	7 37.9	59	3.1	119	6.2	179	9.4
60	8 00.0	8 01.3	7 38.1	60	3.2	120	6.3	180	9.5

292626 O - 55 - 19

32m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	8 00.0	8 01.3	7 38.1	0	0.0	60	3.3	120	6.5
1	8 00.3	8 01.6	7 38.4	1	0.1	61	3.3	121	6.6
2	8 00.5	8 01.8	7 38.6	2	0.1	62	3.4	122	6.6
3	8 00.8	8 02.1	7 38.8	3	0.2	63	3.4	123	6.7
4	8 01.0	8 02.3	7 39.1	4	0.2	64	3.5	124	6.7
5	8 01.3	8 02.6	7 39.3	5	0.3	65	3.5	125	6.8
6	8 01.5	8 02.8	7 39.6	6	0.3	66	3.6	126	6.8
7	8 01.8	8 03.1	7 39.8	7	0.4	67	3.6	127	6.9
8	8 02.0	8 03.3	7 40.0	8	0.4	68	3.7	128	6.9
9	8 02.3	8 03.6	7 40.3	9	0.5	69	3.7	129	7.0
10	8 02.5	8 03.8	7 40.5	10	0.5	70	3.8	130	7.0
11	8 02.8	8 04.1	7 40.8	11	0.6	71	3.8	131	7.1
12	8 03.0	8 04.3	7 41.0	12	0.7	72	3.9	132	7.2
13	8 03.3	8 04.6	7 41.2	13	0.7	73	4.0	133	7.2
14	8 03.5	8 04.8	7 41.5	14	0.8	74	4.0	134	7.3
15	8 03.8	8 05.1	7 41.7	15	0.8	75	4.1	135	7.3
16	8 04.0	8 05.3	7 42.0	16	0.9	76	4.1	136	7.4
17	8 04.3	8 05.6	7 42.2	17	0.9	77	4.2	137	7.4
18	8 04.5	8 05.8	7 42.4	18	1.0	78	4.2	138	7.5
19	8 04.8	8 06.1	7 42.7	19	1.0	79	4.3	139	7.5
20	8 05.0	8 06.3	7 42.9	20	1.1	80	4.3	140	7.6
21	8 05.3	8 06.6	7 43.1	21	1.1	81	4.4	141	7.6
22	8 05.5	8 06.8	7 43.4	22	1.2	82	4.4	142	7.7
23	8 05.8	8 07.1	7 43.6	23	1.2	83	4.5	143	7.7
24	8 06.0	8 07.3	7 43.9	24	1.3	84	4.6	144	7.8
25	8 06.3	8 07.6	7 44.1	25	1.4	85	4.6	145	7.9
26	8 06.5	8 07.8	7 44.3	26	1.4	86	4.7	146	7.9
27	8 06.8	8 08.1	7 44.6	27	1.5	87	4.7	147	8.0
28	8 07.0	8 08.3	7 44.8	28	1.5	88	4.8	148	8.0
29	8 07.3	8 08.6	7 45.1	29	1.6	89	4.8	149	8.1
30	8 07.5	8 08.8	7 45.3	30	1.6	90	4.9	150	8.1
31	8 07.8	8 09.1	7 45.5	31	1.7	91	4.9	151	8.2
32	8 08.0	8 09.3	7 45.8	32	1.7	92	5.0	152	8.2
33	8 08.3	8 09.6	7 46.0	33	1.8	93	5.0	153	8.3
34	8 08.5	8 09.8	7 46.2	34	1.8	94	5.1	154	8.3
35	8 08.8	8 10.1	7 46.5	35	1.9	95	5.1	155	8.4
36	8 09.0	8 10.3	7 46.7	36	2.0	96	5.2	156	8.5
37	8 09.3	8 10.6	7 47.0	37	2.0	97	5.3	157	8.5
38	8 09.5	8 10.8	7 47.2	38	2.1	98	5.3	158	8.6
39	8 09.8	8 11.1	7 47.4	39	2.1	99	5.4	159	8.6
40	8 10.0	8 11.3	7 47.7	40	2.2	100	5.4	160	8.7
41	8 10.3	8 11.6	7 47.9	41	2.2	101	5.5	161	8.7
42	8 10.5	8 11.8	7 48.2	42	2.3	102	5.5	162	8.8
43	8 10.8	8 12.1	7 48.4	43	2.3	103	5.6	163	8.8
44	8 11.0	8 12.3	7 48.6	44	2.4	104	5.6	164	8.9
45	8 11.3	8 12.6	7 48.9	45	2.4	105	5.7	165	8.9
46	8 11.5	8 12.8	7 49.1	46	2.5	106	5.7	166	9.0
47	8 11.8	8 13.1	7 49.3	47	2.5	107	5.8	167	9.0
48	8 12.0	8 13.3	7 49.6	48	2.6	108	5.9	168	9.1
49	8 12.3	8 13.6	7 49.8	49	2.7	109	5.9	169	9.2
50	8 12.5	8 13.8	7 50.1	50	2.7	110	6.0	170	9.2
51	8 12.8	8 14.1	7 50.3	51	2.8	111	6.0	171	9.3
52	8 13.0	8 14.3	7 50.5	52	2.8	112	6.1	172	9.3
53	8 13.3	8 14.6	7 50.8	53	2.9	113	6.1	173	9.4
54	8 13.5	8 14.9	7 51.0	54	2.9	114	6.2	174	9.4
55	8 13.8	8 15.1	7 51.3	55	3.0	115	6.2	175	9.5
56	8 14.0	8 15.4	7 51.5	56	3.0	116	6.3	176	9.5
57	8 14.3	8 15.6	7 51.7	57	3.1	117	6.3	177	9.6
58	8 14.5	8 15.9	7 52.0	58	3.1	118	6.4	178	9.6
59	8 14.8	8 16.1	7 52.2	59	3.2	119	6.4	179	9.7
60	8 15.0	8 16.4	7 52.5	60	3.3	120	6.5	180	9.8

33m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	8 15.0	8 16.4	7 52.5	0	0.0	60	3.4	120	6.7
1	8 15.3	8 16.6	7 52.7	1	0.1	61	3.4	121	6.8
2	8 15.5	8 16.9	7 52.9	2	0.1	62	3.5	122	6.8
3	8 15.8	8 17.1	7 53.2	3	0.2	63	3.5	123	6.9
4	8 16.0	8 17.4	7 53.4	4	0.2	64	3.6	124	6.9
5	8 16.3	8 17.6	7 53.6	5	0.3	65	3.6	125	7.0
6	8 16.5	8 17.9	7 53.9	6	0.3	66	3.7	126	7.0
7	8 16.8	8 18.1	7 54.1	7	0.4	67	3.7	127	7.1
8	8 17.0	8 18.4	7 54.4	8	0.4	68	3.8	128	7.1
9	8 17.3	8 18.6	7 54.6	9	0.5	69	3.9	129	7.2
10	8 17.5	8 18.9	7 54.8	10	0.6	70	3.9	130	7.3
11	8 17.8	8 19.1	7 55.1	11	0.6	71	4.0	131	7.3
12	8 18.0	8 19.4	7 55.3	12	0.7	72	4.0	132	7.4
13	8 18.3	8 19.6	7 55.6	13	0.7	73	4.1	133	7.4
14	8 18.5	8 19.9	7 55.8	14	0.8	74	4.1	134	7.5
15	8 18.8	8 20.1	7 56.0	15	0.8	75	4.2	135	7.5
16	8 19.0	8 20.4	7 56.3	16	0.9	76	4.2	136	7.6
17	8 19.3	8 20.6	7 56.5	17	0.9	77	4.3	137	7.6
18	8 19.5	8 20.9	7 56.7	18	1.0	78	4.4	138	7.7
19	8 19.8	8 21.1	7 57.0	19	1.1	79	4.4	139	7.8
20	8 20.0	8 21.4	7 57.2	20	1.1	80	4.5	140	7.8
21	8 20.3	8 21.6	7 57.5	21	1.2	81	4.5	141	7.9
22	8 20.5	8 21.9	7 57.7	22	1.2	82	4.6	142	7.9
23	8 20.8	8 22.1	7 57.9	23	1.3	83	4.6	143	8.0
24	8 21.0	8 22.4	7 58.2	24	1.3	84	4.7	144	8.0
25	8 21.3	8 22.6	7 58.4	25	1.4	85	4.7	145	8.1
26	8 21.5	8 22.9	7 58.7	26	1.5	86	4.8	146	8.2
27	8 21.8	8 23.1	7 58.9	27	1.5	87	4.9	147	8.2
28	8 22.0	8 23.4	7 59.1	28	1.6	88	4.9	148	8.3
29	8 22.3	8 23.6	7 59.4	29	1.6	89	5.0	149	8.3
30	8 22.5	8 23.9	7 59.6	30	1.7	90	5.0	150	8.4
31	8 22.8	8 24.1	7 59.8	31	1.7	91	5.1	151	8.4
32	8 23.0	8 24.4	8 00.1	32	1.8	92	5.1	152	8.5
33	8 23.3	8 24.6	8 00.3	33	1.8	93	5.2	153	8.5
34	8 23.5	8 24.9	8 00.6	34	1.9	94	5.2	154	8.6
35	8 23.8	8 25.1	8 00.8	35	2.0	95	5.3	155	8.7
36	8 24.0	8 25.4	8 01.0	36	2.0	96	5.4	156	8.7
37	8 24.3	8 25.6	8 01.3	37	2.1	97	5.4	157	8.8
38	8 24.5	8 25.9	8 01.5	38	2.1	98	5.5	158	8.8
39	8 24.8	8 26.1	8 01.8	39	2.2	99	5.5	159	8.9
40	8 25.0	8 26.4	8 02.0	40	2.2	100	5.6	160	8.9
41	8 25.3	8 26.6	8 02.2	41	2.3	101	5.6	161	9.0
42	8 25.5	8 26.9	8 02.5	42	2.3	102	5.7	162	9.0
43	8 25.8	8 27.1	8 02.7	43	2.4	103	5.8	163	9.1
44	8 26.0	8 27.4	8 02.9	44	2.5	104	5.8	164	9.2
45	8 26.3	8 27.6	8 03.2	45	2.5	105	5.9	165	9.2
46	8 26.5	8 27.9	8 03.4	46	2.6	106	5.9	166	9.3
47	8 26.8	8 28.1	8 03.7	47	2.6	107	6.0	167	9.3
48	8 27.0	8 28.4	8 03.9	48	2.7	108	6.0	168	9.4
49	8 27.3	8 28.6	8 04.1	49	2.7	109	6.1	169	9.4
50	8 27.5	8 28.9	8 04.4	50	2.8	110	6.1	170	9.5
51	8 27.8	8 29.1	8 04.6	51	2.8	111	6.2	171	9.5
52	8 28.0	8 29.4	8 04.9	52	2.9	112	6.3	172	9.6
53	8 28.3	8 29.6	8 05.1	53	3.0	113	6.3	173	9.7
54	8 28.5	8 29.9	8 05.3	54	3.0	114	6.4	174	9.7
55	8 28.8	8 30.1	8 05.6	55	3.1	115	6.4	175	9.8
56	8 29.0	8 30.4	8 05.8	56	3.1	116	6.5	176	9.8
57	8 29.3	8 30.6	8 06.1	57	3.2	117	6.5	177	9.9
58	8 29.5	8 30.9	8 06.3	58	3.2	118	6.6	178	9.9
59	8 29.8	8 31.1	8 06.5	59	3.3	119	6.6	179	10.0
60	8 30.0	8 31.4	8 06.8	60	3.4	120	6.7	180	10.1

34m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	8 30.0	8 31.4	8 06.8	0	0.0	60	3.5	120	6.9
1	8 30.3	8 31.6	8 07.0	1	0.1	61	3.5	121	7.0
2	8 30.5	8 31.9	8 07.2	2	0.1	62	3.6	122	7.0
3	8 30.8	8 32.1	8 07.5	3	0.2	63	3.6	123	7.1
4	8 31.0	8 32.4	8 07.7	4	0.2	64	3.7	124	7.1
5	8 31.3	8 32.6	8 08.0	5	0.3	65	3.7	125	7.2
6	8 31.5	8 32.9	8 08.2	6	0.3	66	3.8	126	7.2
7	8 31.8	8 33.2	8 08.4	7	0.4	67	3.9	127	7.3
8	8 32.0	8 33.4	8 08.7	8	0.5	68	3.9	128	7.4
9	8 32.3	8 33.7	8 08.9	9	0.5	69	4.0	129	7.4
10	8 32.5	8 33.9	8 09.2	10	0.6	70	4.0	130	7.5
11	8 32.8	8 34.2	8 09.4	11	0.6	71	4.1	131	7.5
12	8 33.0	8 34.4	8 09.6	12	0.7	72	4.1	132	7.6
13	8 33.3	8 34.7	8 09.9	13	0.7	73	4.2	133	7.6
14	8 33.5	8 34.9	8 10.1	14	0.8	74	4.3	134	7.7
15	8 33.8	8 35.2	8 10.3	15	0.9	75	4.3	135	7.8
16	8 34.0	8 35.4	8 10.6	16	0.9	76	4.4	136	7.8
17	8 34.3	8 35.7	8 10.8	17	1.0	77	4.4	137	7.9
18	8 34.5	8 35.9	8 11.1	18	1.0	78	4.5	138	7.9
19	8 34.8	8 36.2	8 11.3	19	1.1	79	4.5	139	8.0
20	8 35.0	8 36.4	8 11.5	20	1.2	80	4.6	140	8.1
21	8 35.3	8 36.7	8 11.8	21	1.2	81	4.7	141	8.1
22	8 35.5	8 36.9	8 12.0	22	1.3	82	4.7	142	8.2
23	8 35.8	8 37.2	8 12.3	23	1.3	83	4.8	143	8.2
24	8 36.0	8 37.4	8 12.5	24	1.4	84	4.8	144	8.3
25	8 36.3	8 37.7	8 12.7	25	1.4	85	4.9	145	8.3
26	8 36.5	8 37.9	8 13.0	26	1.5	86	4.9	146	8.4
27	8 36.8	8 38.2	8 13.2	27	1.6	87	5.0	147	8.5
28	8 37.0	8 38.4	8 13.4	28	1.6	88	5.1	148	8.5
29	8 37.3	8 38.7	8 13.7	29	1.7	89	5.1	149	8.6
30	8 37.5	8 38.9	8 13.9	30	1.7	90	5.2	150	8.6
31	8 37.8	8 39.2	8 14.2	31	1.8	91	5.2	151	8.7
32	8 38.0	8 39.4	8 14.4	32	1.8	92	5.3	152	8.7
33	8 38.3	8 39.7	8 14.6	33	1.9	93	5.3	153	8.8
34	8 38.5	8 39.9	8 14.9	34	2.0	94	5.4	154	8.9
35	8 38.8	8 40.2	8 15.1	35	2.0	95	5.5	155	8.9
36	8 39.0	8 40.4	8 15.4	36	2.1	96	5.5	156	9.0
37	8 39.3	8 40.7	8 15.6	37	2.1	97	5.6	157	9.0
38	8 39.5	8 40.9	8 15.8	38	2.2	98	5.6	158	9.1
39	8 39.8	8 41.2	8 16.1	39	2.2	99	5.7	159	9.1
40	8 40.0	8 41.4	8 16.3	40	2.3	100	5.8	160	9.2
41	8 40.3	8 41.7	8 16.5	41	2.4	101	5.8	161	9.3
42	8 40.5	8 41.9	8 16.8	42	2.4	102	5.9	162	9.3
43	8 40.8	8 42.2	8 17.0	43	2.5	103	5.9	163	9.4
44	8 41.0	8 42.4	8 17.3	44	2.5	104	6.0	164	9.4
45	8 41.3	8 42.7	8 17.5	45	2.6	105	6.0	165	9.5
46	8 41.5	8 42.9	8 17.7	46	2.6	106	6.1	166	9.5
47	8 41.8	8 43.2	8 18.0	47	2.7	107	6.2	167	9.6
48	8 42.0	8 43.4	8 18.2	48	2.8	108	6.2	168	9.7
49	8 42.3	8 43.7	8 18.5	49	2.8	109	6.3	169	9.7
50	8 42.5	8 43.9	8 18.7	50	2.9	110	6.3	170	9.8
51	8 42.8	8 44.2	8 18.9	51	2.9	111	6.4	171	9.8
52	8 43.0	8 44.4	8 19.2	52	3.0	112	6.4	172	9.9
53	8 43.3	8 44.7	8 19.4	53	3.0	113	6.5	173	9.9
54	8 43.5	8 44.9	8 19.7	54	3.1	114	6.6	174	10.0
55	8 43.8	8 45.2	8 19.9	55	3.2	115	6.6	175	10.1
56	8 44.0	8 45.4	8 20.1	56	3.2	116	6.7	176	10.1
57	8 44.3	8 45.7	8 20.4	57	3.3	117	6.7	177	10.2
58	8 44.5	8 45.9	8 20.6	58	3.3	118	6.8	178	10.2
59	8 44.8	8 46.2	8 20.8	59	3.4	119	6.8	179	10.3
60	8 45.0	8 46.4	8 21.1	60	3.5	120	6.9	180	10.4

35m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	8 45.0	8 46.4	8 21.1	0	0.0	60	3.6	120	7.1
1	8 45.3	8 46.7	8 21.3	1	0.1	61	3.6	121	7.2
2	8 45.5	8 46.9	8 21.6	2	0.1	62	3.7	122	7.2
3	8 45.8	8 47.2	8 21.8	3	0.2	63	3.7	123	7.3
4	8 46.0	8 47.4	8 22.0	4	0.2	64	3.8	124	7.3
5	8 46.3	8 47.7	8 22.3	5	0.3	65	3.8	125	7.4
6	8 46.5	8 47.9	8 22.5	6	0.4	66	3.9	126	7.5
7	8 46.8	8 48.2	8 22.8	7	0.4	67	4.0	127	7.5
8	8 47.0	8 48.4	8 23.0	8	0.5	68	4.0	128	7.6
9	8 47.3	8 48.7	8 23.2	9	0.5	69	4.1	129	7.6
10	8 47.5	8 48.9	8 23.5	10	0.6	70	4.1	130	7.7
11	8 47.8	8 49.2	8 23.7	11	0.7	71	4.2	131	7.8
12	8 48.0	8 49.4	8 23.9	12	0.7	72	4.3	132	7.8
13	8 48.3	8 49.7	8 24.2	13	0.8	73	4.3	133	7.9
14	8 48.5	8 49.9	8 24.4	14	0.8	74	4.4	134	7.9
15	8 48.8	8 50.2	8 24.7	15	0.9	75	4.4	135	8.0
16	8 49.0	8 50.4	8 24.9	16	0.9	76	4.5	136	8.0
17	8 49.3	8 50.7	8 25.1	17	1.0	77	4.6	137	8.1
18	8 49.5	8 50.9	8 25.4	18	1.1	78	4.6	138	8.2
19	8 49.8	8 51.2	8 25.6	19	1.1	79	4.7	139	8.2
20	8 50.0	8 51.5	8 25.9	20	1.2	80	4.7	140	8.3
21	8 50.3	8 51.7	8 26.1	21	1.2	81	4.8	141	8.3
22	8 50.5	8 52.0	8 26.3	22	1.3	82	4.9	142	8.4
23	8 50.8	8 52.2	8 26.6	23	1.4	83	4.9	143	8.5
24	8 51.0	8 52.5	8 26.8	24	1.4	84	5.0	144	8.5
25	8 51.3	8 52.7	8 27.0	25	1.5	85	5.0	145	8.6
26	8 51.5	8 53.0	8 27.3	26	1.5	86	5.1	146	8.6
27	8 51.8	8 53.2	8 27.5	27	1.6	87	5.1	147	8.7
28	8 52.0	8 53.5	8 27.8	28	1.7	88	5.2	148	8.8
29	8 52.3	8 53.7	8 28.0	29	1.7	89	5.3	149	8.8
30	8 52.5	8 54.0	8 28.2	30	1.8	90	5.3	150	8.9
31	8 52.8	8 54.2	8 28.5	31	1.8	91	5.4	151	8.9
32	8 53.0	8 54.5	8 28.7	32	1.9	92	5.4	152	9.0
33	8 53.3	8 54.7	8 29.0	33	2.0	93	5.5	153	9.1
34	8 53.5	8 55.0	8 29.2	34	2.0	94	5.6	154	9.1
35	8 53.8	8 55.2	8 29.4	35	2.1	95	5.6	155	9.2
36	8 54.0	8 55.5	8 29.7	36	2.1	96	5.7	156	9.2
37	8 54.3	8 55.7	8 29.9	37	2.2	97	5.7	157	9.3
38	8 54.5	8 56.0	8 30.2	38	2.2	98	5.8	158	9.3
39	8 54.8	8 56.2	8 30.4	39	2.3	99	5.9	159	9.4
40	8 55.0	8 56.5	8 30.6	40	2.4	100	5.9	160	9.5
41	8 55.3	8 56.7	8 30.9	41	2.4	101	6.0	161	9.5
42	8 55.5	8 57.0	8 31.1	42	2.5	102	6.0	162	9.6
43	8 55.8	8 57.2	8 31.3	43	2.5	103	6.1	163	9.6
44	8 56.0	8 57.5	8 31.6	44	2.6	104	6.2	164	9.7
45	8 56.3	8 57.7	8 31.8	45	2.7	105	6.2	165	9.8
46	8 56.5	8 58.0	8 32.1	46	2.7	106	6.3	166	9.8
47	8 56.8	8 58.2	8 32.3	47	2.8	107	6.3	167	9.9
48	8 57.0	8 58.5	8 32.5	48	2.8	108	6.4	168	9.9
49	8 57.3	8 58.7	8 32.8	49	2.9	109	6.4	169	10.0
50	8 57.5	8 59.0	8 33.0	50	3.0	110	6.5	170	10.1
51	8 57.8	8 59.2	8 33.3	51	3.0	111	6.6	171	10.1
52	8 58.0	8 59.5	8 33.5	52	3.1	112	6.6	172	10.2
53	8 58.3	8 59.7	8 33.7	53	3.1	113	6.7	173	10.2
54	8 58.5	9 00.0	8 34.0	54	3.2	114	6.7	174	10.3
55	8 58.8	9 00.2	8 34.2	55	3.3	115	6.8	175	10.4
56	8 59.0	9 00.5	8 34.4	56	3.3	116	6.9	176	10.4
57	8 59.3	9 00.7	8 34.7	57	3.4	117	6.9	177	10.5
58	8 59.5	9 01.0	8 34.9	58	3.4	118	7.0	178	10.5
59	8 59.8	9 01.2	8 35.2	59	3.5	119	7.0	179	10.6
60	9 00.0	9 01.5	8 35.4	60	3.6	120	7.1	180	10.7

36m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	9 00.0	9 01.5	8 35.4	0	0.0	60	3.7	120	7.3
1	9 00.3	9 01.7	8 35.6	1	0.1	61	3.7	121	7.4
2	9 00.5	9 02.0	8 35.9	2	0.1	62	3.8	122	7.4
3	9 00.8	9 02.2	8 36.1	3	0.2	63	3.8	123	7.5
4	9 01.0	9 02.5	8 36.4	4	0.2	64	3.9	124	7.5
5	9 01.3	9 02.7	8 36.6	5	0.3	65	4.0	125	7.6
6	9 01.5	9 03.0	8 36.8	6	0.4	66	4.0	126	7.7
7	9 01.8	9 03.2	8 37.1	7	0.4	67	4.1	127	7.7
8	9 02.0	9 03.5	8 37.3	8	0.5	68	4.1	128	7.8
9	9 02.3	9 03.7	8 37.5	9	0.5	69	4.2	129	7.8
10	9 02.5	9 04.0	8 37.8	10	0.6	70	4.3	130	7.9
11	9 02.8	9 04.2	8 38.0	11	0.7	71	4.3	131	8.0
12	9 03.0	9 04.5	8 38.3	12	0.7	72	4.4	132	8.0
13	9 03.3	9 04.7	8 38.5	13	0.8	73	4.4	133	8.1
14	9 03.5	9 05.0	8 38.7	14	0.9	74	4.5	134	8.2
15	9 03.8	9 05.2	8 39.0	15	0.9	75	4.6	135	8.2
16	9 04.0	9 05.5	8 39.2	16	1.0	76	4.6	136	8.3
17	9 04.3	9 05.7	8 39.5	17	1.0	77	4.7	137	8.3
18	9 04.5	9 06.0	8 39.7	18	1.1	78	4.7	138	8.4
19	9 04.8	9 06.2	8 39.9	19	1.2	79	4.8	139	8.5
20	9 05.0	9 06.5	8 40.2	20	1.2	80	4.9	140	8.5
21	9 05.3	9 06.7	8 40.4	21	1.3	81	4.9	141	8.6
22	9 05.5	9 07.0	8 40.6	22	1.3	82	5.0	142	8.6
23	9 05.8	9 07.2	8 40.9	23	1.4	83	5.0	143	8.7
24	9 06.0	9 07.5	8 41.1	24	1.5	84	5.1	144	8.8
25	9 06.3	9 07.7	8 41.4	25	1.5	85	5.2	145	8.8
26	9 06.5	9 08.0	8 41.6	26	1.6	86	5.2	146	8.9
27	9 06.8	9 08.2	8 41.8	27	1.6	87	5.3	147	8.9
28	9 07.0	9 08.5	8 42.1	28	1.7	88	5.4	148	9.0
29	9 07.3	9 08.7	8 42.3	29	1.8	89	5.4	149	9.1
30	9 07.5	9 09.0	8 42.6	30	1.8	90	5.5	150	9.1
31	9 07.8	9 09.2	8 42.8	31	1.9	91	5.5	151	9.2
32	9 08.0	9 09.5	8 43.0	32	1.9	92	5.6	152	9.2
33	9 08.3	9 09.8	8 43.3	33	2.0	93	5.7	153	9.3
34	9 08.5	9 10.0	8 43.5	34	2.1	94	5.7	154	9.4
35	9 08.8	9 10.3	8 43.8	35	2.1	95	5.8	155	9.4
36	9 09.0	9 10.5	8 44.0	36	2.2	96	5.8	156	9.5
37	9 09.3	9 10.8	8 44.2	37	2.3	97	5.9	157	9.6
38	9 09.5	9 11.0	8 44.5	38	2.3	98	6.0	158	9.6
39	9 09.8	9 11.3	8 44.7	39	2.4	99	6.0	159	9.7
40	9 10.0	9 11.5	8 44.9	40	2.4	100	6.1	160	9.7
41	9 10.3	9 11.8	8 45.2	41	2.5	101	6.1	161	9.8
42	9 10.5	9 12.0	8 45.4	42	2.6	102	6.2	162	9.9
43	9 10.8	9 12.3	8 45.7	43	2.6	103	6.3	163	9.9
44	9 11.0	9 12.5	8 45.9	44	2.7	104	6.3	164	10.0
45	9 11.3	9 12.8	8 46.1	45	2.7	105	6.4	165	10.0
46	9 11.5	9 13.0	8 46.4	46	2.8	106	6.4	166	10.1
47	9 11.8	9 13.3	8 46.6	47	2.9	107	6.5	167	10.2
48	9 12.0	9 13.5	8 46.9	48	2.9	108	6.6	168	10.2
49	9 12.3	9 13.8	8 47.1	49	3.0	109	6.6	169	10.3
50	9 12.5	9 14.0	8 47.3	50	3.0	110	6.7	170	10.3
51	9 12.8	9 14.3	8 47.6	51	3.1	111	6.8	171	10.4
52	9 13.0	9 14.5	8 47.8	52	3.2	112	6.8	172	10.5
53	9 13.3	9 14.8	8 48.0	53	3.2	113	6.9	173	10.5
54	9 13.5	9 15.0	8 48.3	54	3.3	114	6.9	174	10.6
55	9 13.8	9 15.3	8 48.5	55	3.3	115	7.0	175	10.6
56	9 14.0	9 15.5	8 48.8	56	3.4	116	7.1	176	10.7
57	9 14.3	9 15.8	8 49.0	57	3.5	117	7.1	177	10.8
58	9 14.5	9 16.0	8 49.2	58	3.5	118	7.2	178	10.8
59	9 14.8	9 16.3	8 49.5	59	3.6	119	7.2	179	10.9
60	9 15.0	9 16.5	8 49.7	60	3.7	120	7.3	180	11.0

37m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	9 15.0	9 16.5	8 49.7	0	0.0	60	3.8	120	7.5
1	9 15.3	9 16.8	8 50.0	1	0.1	61	3.8	121	7.6
2	9 15.5	9 17.0	8 50.2	2	0.1	62	3.9	122	7.6
3	9 15.8	9 17.3	8 50.4	3	0.2	63	3.9	123	7.7
4	9 16.0	9 17.5	8 50.7	4	0.3	64	4.0	124	7.8
5	9 16.3	9 17.8	8 50.9	5	0.3	65	4.1	125	7.8
6	9 16.5	9 18.0	8 51.1	6	0.4	66	4.1	126	7.9
7	9 16.8	9 18.3	8 51.4	7	0.4	67	4.2	127	7.9
8	9 17.0	9 18.5	8 51.6	8	0.5	68	4.3	128	8.0
9	9 17.3	9 18.8	8 51.9	9	0.6	69	4.3	129	8.1
10	9 17.5	9 19.0	8 52.1	10	0.6	70	4.4	130	8.1
11	9 17.8	9 19.3	8 52.3	11	0.7	71	4.4	131	8.2
12	9 18.0	9 19.5	8 52.6	12	0.8	72	4.5	132	8.3
13	9 18.3	9 19.8	8 52.8	13	0.8	73	4.6	133	8.3
14	9 18.5	9 20.0	8 53.1	14	0.9	74	4.6	134	8.4
15	9 18.8	9 20.3	8 53.3	15	0.9	75	4.7	135	8.4
16	9 19.0	9 20.5	8 53.5	16	1.0	76	4.8	136	8.5
17	9 19.3	9 20.8	8 53.8	17	1.1	77	4.8	137	8.6
18	9 19.5	9 21.0	8 54.0	18	1.1	78	4.9	138	8.6
19	9 19.8	9 21.3	8 54.3	19	1.2	79	4.9	139	8.7
20	9 20.0	9 21.5	8 54.5	20	1.3	80	5.0	140	8.8
21	9 20.3	9 21.8	8 54.7	21	1.3	81	5.1	141	8.8
22	9 20.5	9 22.0	8 55.0	22	1.4	82	5.1	142	8.9
23	9 20.8	9 22.3	8 55.2	23	1.4	83	5.2	143	8.9
24	9 21.0	9 22.5	8 55.4	24	1.5	84	5.3	144	9.0
25	9 21.3	9 22.8	8 55.7	25	1.6	85	5.3	145	9.1
26	9 21.5	9 23.0	8 55.9	26	1.6	86	5.4	146	9.1
27	9 21.8	9 23.3	8 56.2	27	1.7	87	5.4	147	9.2
28	9 22.0	9 23.5	8 56.4	28	1.8	88	5.5	148	9.3
29	9 22.3	9 23.8	8 56.6	29	1.8	89	5.6	149	9.3
30	9 22.5	9 24.0	8 56.9	30	1.9	90	5.6	150	9.4
31	9 22.8	9 24.3	8 57.1	31	1.9	91	5.7	151	9.4
32	9 23.0	9 24.5	8 57.4	32	2.0	92	5.8	152	9.5
33	9 23.3	9 24.8	8 57.6	33	2.1	93	5.8	153	9.6
34	9 23.5	9 25.0	8 57.8	34	2.1	94	5.9	154	9.6
35	9 23.8	9 25.3	8 58.1	35	2.2	95	5.9	155	9.7
36	9 24.0	9 25.5	8 58.3	36	2.3	96	6.0	156	9.8
37	9 24.3	9 25.8	8 58.5	37	2.3	97	6.1	157	9.8
38	9 24.5	9 26.0	8 58.8	38	2.4	98	6.1	158	9.9
39	9 24.8	9 26.3	8 59.0	39	2.4	99	6.2	159	9.9
40	9 25.0	9 26.5	8 59.3	40	2.5	100	6.3	160	10.0
41	9 25.3	9 26.8	8 59.5	41	2.6	101	6.3	161	10.1
42	9 25.5	9 27.0	8 59.7	42	2.6	102	6.4	162	10.1
43	9 25.8	9 27.3	9 00.0	43	2.7	103	6.4	163	10.2
44	9 26.0	9 27.5	9 00.2	44	2.8	104	6.5	164	10.3
45	9 26.3	9 27.8	9 00.5	45	2.8	105	6.6	165	10.3
46	9 26.5	9 28.1	9 00.7	46	2.9	106	6.6	166	10.4
47	9 26.8	9 28.3	9 00.9	47	2.9	107	6.7	167	10.4
48	9 27.0	9 28.6	9 01.2	48	3.0	108	6.8	168	10.5
49	9 27.3	9 28.8	9 01.4	49	3.1	109	6.8	169	10.6
50	9 27.5	9 29.1	9 01.6	50	3.1	110	6.9	170	10.6
51	9 27.8	9 29.3	9 01.9	51	3.2	111	6.9	171	10.7
52	9 28.0	9 29.6	9 02.1	52	3.3	112	7.0	172	10.8
53	9 28.3	9 29.8	9 02.4	53	3.3	113	7.1	173	10.8
54	9 28.5	9 30.1	9 02.6	54	3.4	114	7.1	174	10.9
55	9 28.8	9 30.3	9 02.8	55	3.4	115	7.2	175	10.9
56	9 29.0	9 30.6	9 03.1	56	3.5	116	7.3	176	11.0
57	9 29.3	9 30.8	9 03.3	57	3.6	117	7.3	177	11.1
58	9 29.5	9 31.1	9 03.6	58	3.6	118	7.4	178	11.1
59	9 29.8	9 31.3	9 03.8	59	3.7	119	7.4	179	11.2
60	9 30.0	9 31.6	9 04.0	60	3.8	120	7.5	180	11.3

38m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	9 30.0	9 31.6	9 04.0	0	0.0	60	3.9	120	7.7
1	9 30.3	9 31.8	9 04.3	1	0.1	61	3.9	121	7.8
2	9 30.5	9 32.1	9 04.5	2	0.1	62	4.0	122	7.8
3	9 30.8	9 32.3	9 04.7	3	0.2	63	4.0	123	7.9
4	9 31.0	9 32.6	9 05.0	4	0.3	64	4.1	124	8.0
5	9 31.3	9 32.8	9 05.2	5	0.3	65	4.2	125	8.0
6	9 31.5	9 33.1	9 05.5	6	0.4	66	4.2	126	8.1
7	9 31.8	9 33.3	9 05.7	7	0.4	67	4.3	127	8.1
8	9 32.0	9 33.6	9 05.9	8	0.5	68	4.4	128	8.2
9	9 32.3	9 33.8	9 06.2	9	0.6	69	4.4	129	8.3
10	9 32.5	9 34.1	9 06.4	10	0.6	70	4.5	130	8.3
11	9 32.8	9 34.3	9 06.7	11	0.7	71	4.6	131	8.4
12	9 33.0	9 34.6	9 06.9	12	0.8	72	4.6	132	8.5
13	9 33.3	9 34.8	9 07.1	13	0.8	73	4.7	133	8.5
14	9 33.5	9 35.1	9 07.4	14	0.9	74	4.7	134	8.6
15	9 33.8	9 35.3	9 07.6	15	1.0	75	4.8	135	8.7
16	9 34.0	9 35.6	9 07.9	16	1.0	76	4.9	136	8.7
17	9 34.3	9 35.8	9 08.1	17	1.1	77	4.9	137	8.8
18	9 34.5	9 36.1	9 08.3	18	1.2	78	5.0	138	8.9
19	9 34.8	9 36.3	9 08.6	19	1.2	79	5.1	139	8.9
20	9 35.0	9 36.6	9 08.8	20	1.3	80	5.1	140	9.0
21	9 35.3	9 36.8	9 09.0	21	1.3	81	5.2	141	9.0
22	9 35.5	9 37.1	9 09.3	22	1.4	82	5.3	142	9.1
23	9 35.8	9 37.3	9 09.5	23	1.5	83	5.3	143	9.2
24	9 36.0	9 37.6	9 09.8	24	1.5	84	5.4	144	9.2
25	9 36.3	9 37.8	9 10.0	25	1.6	85	5.5	145	9.3
26	9 36.5	9 38.1	9 10.2	26	1.7	86	5.5	146	9.4
27	9 36.8	9 38.3	9 10.5	27	1.7	87	5.6	147	9.4
28	9 37.0	9 38.6	9 10.7	28	1.8	88	5.6	148	9.5
29	9 37.3	9 38.8	9 11.0	29	1.9	89	5.7	149	9.6
30	9 37.5	9 39.1	9 11.2	30	1.9	90	5.8	150	9.6
31	9 37.8	9 39.3	9 11.4	31	2.0	91	5.8	151	9.7
32	9 38.0	9 39.6	9 11.7	32	2.1	92	5.9	152	9.8
33	9 38.3	9 39.8	9 11.9	33	2.1	93	6.0	153	9.8
34	9 38.5	9 40.1	9 12.1	34	2.2	94	6.0	154	9.9
35	9 38.8	9 40.3	9 12.4	35	2.2	95	6.1	155	9.9
36	9 39.0	9 40.6	9 12.6	36	2.3	96	6.2	156	10.0
37	9 39.3	9 40.8	9 12.9	37	2.4	97	6.2	157	10.1
38	9 39.5	9 41.1	9 13.1	38	2.4	98	6.3	158	10.1
39	9 39.8	9 41.3	9 13.3	39	2.5	99	6.4	159	10.2
40	9 40.0	9 41.6	9 13.6	40	2.6	100	6.4	160	10.3
41	9 40.3	9 41.8	9 13.8	41	2.6	101	6.5	161	10.3
42	9 40.5	9 42.1	9 14.1	42	2.7	102	6.5	162	10.4
43	9 40.8	9 42.3	9 14.3	43	2.8	103	6.6	163	10.5
44	9 41.0	9 42.6	9 14.5	44	2.8	104	6.7	164	10.5
45	9 41.3	9 42.8	9 14.8	45	2.9	105	6.7	165	10.6
46	9 41.5	9 43.1	9 15.0	46	3.0	106	6.8	166	10.7
47	9 41.8	9 43.3	9 15.2	47	3.0	107	6.9	167	10.7
48	9 42.0	9 43.6	9 15.5	48	3.1	108	6.9	168	10.8
49	9 42.3	9 43.8	9 15.7	49	3.1	109	7.0	169	10.8
50	9 42.5	9 44.1	9 16.0	50	3.2	110	7.1	170	10.9
51	9 42.8	9 44.3	9 16.2	51	3.3	111	7.1	171	11.0
52	9 43.0	9 44.6	9 16.4	52	3.3	112	7.2	172	11.0
53	9 43.3	9 44.8	9 16.7	53	3.4	113	7.3	173	11.1
54	9 43.5	9 45.1	9 16.9	54	3.5	114	7.3	174	11.2
55	9 43.8	9 45.3	9 17.2	55	3.5	115	7.4	175	11.2
56	9 44.0	9 45.6	9 17.4	56	3.6	116	7.4	176	11.3
57	9 44.3	9 45.8	9 17.6	57	3.7	117	7.5	177	11.4
58	9 44.5	9 46.1	9 17.9	58	3.7	118	7.6	178	11.4
59	9 44.8	9 46.4	9 18.1	59	3.8	119	7.6	179	11.5
60	9 45.0	9 46.6	9 18.4	60	3.9	120	7.7	180	11.6

39m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	9 45.0	9 46.6	9 18.4	0	0.0	60	4.0	120	7.9
1	9 45.3	9 46.9	9 18.6	1	0.1	61	4.0	121	8.0
2	9 45.5	9 47.1	9 18.8	2	0.1	62	4.1	122	8.0
3	9 45.8	9 47.4	9 19.1	3	0.2	63	4.1	123	8.1
4	9 46.0	9 47.6	9 19.3	4	0.3	64	4.2	124	8.2
5	9 46.3	9 47.9	9 19.5	5	0.3	65	4.3	125	8.2
6	9 46.5	9 48.1	9 19.8	6	0.4	66	4.3	126	8.3
7	9 46.8	9 48.4	9 20.0	7	0.5	67	4.4	127	8.4
8	9 47.0	9 48.6	9 20.3	8	0.5	68	4.5	128	8.4
9	9 47.3	9 48.9	9 20.5	9	0.6	69	4.5	129	8.5
10	9 47.5	9 49.1	9 20.7	10	0.7	70	4.6	130	8.6
11	9 47.8	9 49.4	9 21.0	11	0.7	71	4.7	131	8.6
12	9 48.0	9 49.6	9 21.2	12	0.8	72	4.7	132	8.7
13	9 48.3	9 49.9	9 21.5	13	0.9	73	4.8	133	8.8
14	9 48.5	9 50.1	9 21.7	14	0.9	74	4.9	134	8.8
15	9 48.8	9 50.4	9 21.9	15	1.0	75	4.9	135	8.9
16	9 49.0	9 50.6	9 22.2	16	1.1	76	5.0	136	9.0
17	9 49.3	9 50.9	9 22.4	17	1.1	77	5.1	137	9.0
18	9 49.5	9 51.1	9 22.6	18	1.2	78	5.1	138	9.1
19	9 49.8	9 51.4	9 22.9	19	1.3	79	5.2	139	9.2
20	9 50.0	9 51.6	9 23.1	20	1.3	80	5.3	140	9.2
21	9 50.3	9 51.9	9 23.4	21	1.4	81	5.3	141	9.3
22	9 50.5	9 52.1	9 23.6	22	1.4	82	5.4	142	9.3
23	9 50.8	9 52.4	9 23.8	23	1.5	83	5.5	143	9.4
24	9 51.0	9 52.6	9 24.1	24	1.6	84	5.5	144	9.5
25	9 51.3	9 52.9	9 24.3	25	1.6	85	5.6	145	9.5
26	9 51.5	9 53.1	9 24.6	26	1.7	86	5.7	146	9.6
27	9 51.8	9 53.4	9 24.8	27	1.8	87	5.7	147	9.7
28	9 52.0	9 53.6	9 25.0	28	1.8	88	5.8	148	9.7
29	9 52.3	9 53.9	9 25.3	29	1.9	89	5.9	149	9.8
30	9 52.5	9 54.1	9 25.5	30	2.0	90	5.9	150	9.9
31	9 52.8	9 54.4	9 25.7	31	2.0	91	6.0	151	9.9
32	9 53.0	9 54.6	9 26.0	32	2.1	92	6.1	152	10.0
33	9 53.3	9 54.9	9 26.2	33	2.2	93	6.1	153	10.1
34	9 53.5	9 55.1	9 26.5	34	2.2	94	6.2	154	10.1
35	9 53.8	9 55.4	9 26.7	35	2.3	95	6.3	155	10.2
36	9 54.0	9 55.6	9 26.9	36	2.4	96	6.3	156	10.3
37	9 54.3	9 55.9	9 27.2	37	2.4	97	6.4	157	10.3
38	9 54.5	9 56.1	9 27.4	38	2.5	98	6.5	158	10.4
39	9 54.8	9 56.4	9 27.7	39	2.6	99	6.5	159	10.5
40	9 55.0	9 56.6	9 27.9	40	2.6	100	6.6	160	10.5
41	9 55.3	9 56.9	9 28.1	41	2.7	101	6.6	161	10.6
42	9 55.5	9 57.1	9 28.4	42	2.8	102	6.7	162	10.7
43	9 55.8	9 57.4	9 28.6	43	2.8	103	6.8	163	10.7
44	9 56.0	9 57.6	9 28.8	44	2.9	104	6.8	164	10.8
45	9 56.3	9 57.9	9 29.1	45	3.0	105	6.9	165	10.9
46	9 56.5	9 58.1	9 29.3	46	3.0	106	7.0	166	10.9
47	9 56.8	9 58.4	9 29.6	47	3.1	107	7.0	167	11.0
48	9 57.0	9 58.6	9 29.8	48	3.2	108	7.1	168	11.1
49	9 57.3	9 58.9	9 30.0	49	3.2	109	7.2	169	11.1
50	9 57.5	9 59.1	9 30.3	50	3.3	110	7.2	170	11.2
51	9 57.8	9 59.4	9 30.5	51	3.4	111	7.3	171	11.3
52	9 58.0	9 59.6	9 30.8	52	3.4	112	7.4	172	11.3
53	9 58.3	9 59.9	9 31.0	53	3.5	113	7.4	173	11.4
54	9 58.5	10 00.1	9 31.2	54	3.6	114	7.5	174	11.5
55	9 58.8	10 00.4	9 31.5	55	3.6	115	7.6	175	11.5
56	9 59.0	10 00.6	9 31.7	56	3.7	116	7.6	176	11.6
57	9 59.3	10 00.9	9 32.0	57	3.8	117	7.7	177	11.7
58	9 59.5	10 01.1	9 32.2	58	3.8	118	7.8	178	11.7
59	9 59.8	10 01.4	9 32.4	59	3.9	119	7.8	179	11.8
60	10 00.0	10 01.6	9 32.7	60	4.0	120	7.9	180	11.9

40m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	10 00.0	10 01.6	9 32.7	0	0.0	60	4.1	120	8.1
1	10 00.3	10 01.9	9 32.9	1	0.1	61	4.1	121	8.2
2	10 00.5	10 02.1	9 33.1	2	0.1	62	4.2	122	8.2
3	10 00.8	10 02.4	9 33.4	3	0.2	63	4.3	123	8.3
4	10 01.0	10 02.6	9 33.6	4	0.3	64	4.3	124	8.4
5	10 01.3	10 02.9	9 33.9	5	0.3	65	4.4	125	8.4
6	10 01.5	10 03.1	9 34.1	6	0.4	66	4.5	126	8.5
7	10 01.8	10 03.4	9 34.3	7	0.5	67	4.5	127	8.6
8	10 02.0	10 03.6	9 34.6	8	0.5	68	4.6	128	8.6
9	10 02.3	10 03.9	9 34.8	9	0.6	69	4.7	129	8.7
10	10 02.5	10 04.1	9 35.1	10	0.7	70	4.7	130	8.8
11	10 02.8	10 04.4	9 35.3	11	0.7	71	4.8	131	8.8
12	10 03.0	10 04.7	9 35.5	12	0.8	72	4.9	132	8.9
13	10 03.3	10 04.9	9 35.8	13	0.9	73	4.9	133	9.0
14	10 03.5	10 05.2	9 36.0	14	0.9	74	5.0	134	9.0
15	10 03.8	10 05.4	9 36.2	15	1.0	75	5.1	135	9.1
16	10 04.0	10 05.7	9 36.5	16	1.1	76	5.1	136	9.2
17	10 04.3	10 05.9	9 36.7	17	1.1	77	5.2	137	9.2
18	10 04.5	10 06.2	9 37.0	18	1.2	78	5.3	138	9.3
19	10 04.8	10 06.4	9 37.2	19	1.3	79	5.3	139	9.4
20	10 05.0	10 06.7	9 37.4	20	1.4	80	5.4	140	9.5
21	10 05.3	10 06.9	9 37.7	21	1.4	81	5.5	141	9.5
22	10 05.5	10 07.2	9 37.9	22	1.5	82	5.5	142	9.6
23	10 05.8	10 07.4	9 38.2	23	1.6	83	5.6	143	9.7
24	10 06.0	10 07.7	9 38.4	24	1.6	84	5.7	144	9.7
25	10 06.3	10 07.9	9 38.6	25	1.7	85	5.7	145	9.8
26	10 06.5	10 08.2	9 38.9	26	1.8	86	5.8	146	9.9
27	10 06.8	10 08.4	9 39.1	27	1.8	87	5.9	147	9.9
28	10 07.0	10 08.7	9 39.3	28	1.9	88	5.9	148	10.0
29	10 07.3	10 08.9	9 39.6	29	2.0	89	6.0	149	10.1
30	10 07.5	10 09.2	9 39.8	30	2.0	90	6.1	150	10.1
31	10 07.8	10 09.4	9 40.1	31	2.1	91	6.1	151	10.2
32	10 08.0	10 09.7	9 40.3	32	2.2	92	6.2	152	10.3
33	10 08.3	10 09.9	9 40.5	33	2.2	93	6.3	153	10.3
34	10 08.5	10 10.2	9 40.8	34	2.3	94	6.3	154	10.4
35	10 08.8	10 10.4	9 41.0	35	2.4	95	6.4	155	10.5
36	10 09.0	10 10.7	9 41.3	36	2.4	96	6.5	156	10.5
37	10 09.3	10 10.9	9 41.5	37	2.5	97	6.5	157	10.6
38	10 09.5	10 11.2	9 41.7	38	2.6	98	6.6	158	10.7
39	10 09.8	10 11.4	9 42.0	39	2.6	99	6.7	159	10.7
40	10 10.0	10 11.7	9 42.2	40	2.7	100	6.8	160	10.8
41	10 10.3	10 11.9	9 42.4	41	2.8	101	6.8	161	10.9
42	10 10.5	10 12.2	9 42.7	42	2.8	102	6.9	162	10.9
43	10 10.8	10 12.4	9 42.9	43	2.9	103	7.0	163	11.0
44	10 11.0	10 12.7	9 43.2	44	3.0	104	7.0	164	11.1
45	10 11.3	10 12.9	9 43.4	45	3.0	105	7.1	165	11.1
46	10 11.5	10 13.2	9 43.6	46	3.1	106	7.2	166	11.2
47	10 11.8	10 13.4	9 43.9	47	3.2	107	7.2	167	11.3
48	10 12.0	10 13.7	9 44.1	48	3.2	108	7.3	168	11.3
49	10 12.3	10 13.9	9 44.4	49	3.3	109	7.4	169	11.4
50	10 12.5	10 14.2	9 44.6	50	3.4	110	7.4	170	11.5
51	10 12.8	10 14.4	9 44.8	51	3.4	111	7.5	171	11.5
52	10 13.0	10 14.7	9 45.1	52	3.5	112	7.6	172	11.6
53	10 13.3	10 14.9	9 45.3	53	3.6	113	7.6	173	11.7
54	10 13.5	10 15.2	9 45.6	54	3.6	114	7.7	174	11.7
55	10 13.8	10 15.4	9 45.8	55	3.7	115	7.8	175	11.8
56	10 14.0	10 15.7	9 46.0	56	3.8	116	7.8	176	11.9
57	10 14.3	10 15.9	9 46.3	57	3.8	117	7.9	177	11.9
58	10 14.5	10 16.2	9 46.5	58	3.9	118	8.0	178	12.0
59	10 14.8	10 16.4	9 46.7	59	4.0	119	8.0	179	12.1
60	10 15.0	10 16.7	9 47.0	60	4.1	120	8.1	180	12.2

41m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	10 15.0	10 16.7	9 47.0	0	0.0	60	4.2	120	8.3
1	10 15.3	10 16.9	9 47.2	1	0.1	61	4.2	121	8.4
2	10 15.5	10 17.2	9 47.5	2	0.1	62	4.3	122	8.4
3	10 15.8	10 17.4	9 47.7	3	0.2	63	4.4	123	8.5
4	10 16.0	10 17.7	9 47.9	4	0.3	64	4.4	124	8.6
5	10 16.3	10 17.9	9 48.2	5	0.3	65	4.5	125	8.6
6	10 16.5	10 18.2	9 48.4	6	0.4	66	4.6	126	8.7
7	10 16.8	10 18.4	9 48.7	7	0.5	67	4.6	127	8.8
8	10 17.0	10 18.7	9 48.9	8	0.6	68	4.7	128	8.9
9	10 17.3	10 18.9	9 49.1	9	0.6	69	4.8	129	8.9
10	10 17.5	10 19.2	9 49.4	10	0.7	70	4.8	130	9.0
11	10 17.8	10 19.4	9 49.6	11	0.8	71	4.9	131	9.1
12	10 18.0	10 19.7	9 49.8	12	0.8	72	5.0	132	9.1
13	10 18.3	10 19.9	9 50.1	13	0.9	73	5.0	133	9.2
14	10 18.5	10 20.2	9 50.3	14	1.0	74	5.1	134	9.3
15	10 18.8	10 20.4	9 50.6	15	1.0	75	5.2	135	9.3
16	10 19.0	10 20.7	9 50.8	16	1.1	76	5.3	136	9.4
17	10 19.3	10 20.9	9 51.0	17	1.2	77	5.3	137	9.5
18	10 19.5	10 21.2	9 51.3	18	1.2	78	5.4	138	9.5
19	10 19.8	10 21.4	9 51.5	19	1.3	79	5.5	139	9.6
20	10 20.0	10 21.7	9 51.8	20	1.4	80	5.5	140	9.7
21	10 20.3	10 21.9	9 52.0	21	1.5	81	5.6	141	9.8
22	10 20.5	10 22.2	9 52.2	22	1.5	82	5.7	142	9.8
23	10 20.8	10 22.4	9 52.5	23	1.6	83	5.7	143	9.9
24	10 21.0	10 22.7	9 52.7	24	1.7	84	5.8	144	10.0
25	10 21.3	10 23.0	9 52.9	25	1.7	85	5.9	145	10.0
26	10 21.5	10 23.2	9 53.2	26	1.8	86	5.9	146	10.1
27	10 21.8	10 23.5	9 53.4	27	1.9	87	6.0	147	10.2
28	10 22.0	10 23.7	9 53.7	28	1.9	88	6.1	148	10.2
29	10 22.3	10 24.0	9 53.9	29	2.0	89	6.2	149	10.3
30	10 22.5	10 24.2	9 54.1	30	2.1	90	6.2	150	10.4
31	10 22.8	10 24.5	9 54.4	31	2.1	91	6.3	151	10.4
32	10 23.0	10 24.7	9 54.6	32	2.2	92	6.4	152	10.5
33	10 23.3	10 25.0	9 54.9	33	2.3	93	6.4	153	10.6
34	10 23.5	10 25.2	9 55.1	34	2.4	94	6.5	154	10.7
35	10 23.8	10 25.5	9 55.3	35	2.4	95	6.6	155	10.7
36	10 24.0	10 25.7	9 55.6	36	2.5	96	6.6	156	10.8
37	10 24.3	10 26.0	9 55.8	37	2.6	97	6.7	157	10.9
38	10 24.5	10 26.2	9 56.1	38	2.6	98	6.8	158	10.9
39	10 24.8	10 26.5	9 56.3	39	2.7	99	6.8	159	11.0
40	10 25.0	10 26.7	9 56.5	40	2.8	100	6.9	160	11.1
41	10 25.3	10 27.0	9 56.8	41	2.8	101	7.0	161	11.1
42	10 25.5	10 27.2	9 57.0	42	2.9	102	7.1	162	11.2
43	10 25.8	10 27.5	9 57.2	43	3.0	103	7.1	163	11.3
44	10 26.0	10 27.7	9 57.5	44	3.0	104	7.2	164	11.3
45	10 26.3	10 28.0	9 57.7	45	3.1	105	7.3	165	11.4
46	10 26.5	10 28.2	9 58.0	46	3.2	106	7.3	166	11.5
47	10 26.8	10 28.5	9 58.2	47	3.3	107	7.4	167	11.6
48	10 27.0	10 28.7	9 58.4	48	3.3	108	7.5	168	11.6
49	10 27.3	10 29.0	9 58.7	49	3.4	109	7.5	169	11.7
50	10 27.5	10 29.2	9 58.9	50	3.5	110	7.6	170	11.8
51	10 27.8	10 29.5	9 59.2	51	3.5	111	7.7	171	11.8
52	10 28.0	10 29.7	9 59.4	52	3.6	112	7.7	172	11.9
53	10 28.3	10 30.0	9 59.6	53	3.7	113	7.8	173	12.0
54	10 28.5	10 30.2	9 59.9	54	3.7	114	7.9	174	12.0
55	10 28.8	10 30.5	10 00.1	55	3.8	115	8.0	175	12.1
56	10 29.0	10 30.7	10 00.3	56	3.9	116	8.0	176	12.2
57	10 29.3	10 31.0	10 00.6	57	3.9	117	8.1	177	12.2
58	10 29.5	10 31.2	10 00.8	58	4.0	118	8.2	178	12.3
59	10 29.8	10 31.5	10 01.1	59	4.1	119	8.2	179	12.4
60	10 30.0	10 31.7	10 01.3	60	4.2	120	8.3	180	12.5

42m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	10 30.0	10 31.7	10 01.3	0	0.0	60	4.3	120	8.5
1	10 30.3	10 32.0	10 01.5	1	0.1	61	4.3	121	8.6
2	10 30.5	10 32.2	10 01.8	2	0.1	62	4.4	122	8.6
3	10 30.8	10 32.5	10 02.0	3	0.2	63	4.5	123	8.7
4	10 31.0	10 32.7	10 02.3	4	0.3	64	4.5	124	8.8
5	10 31.3	10 33.0	10 02.5	5	0.4	65	4.6	125	8.9
6	10 31.5	10 33.2	10 02.7	6	0.4	66	4.7	126	8.9
7	10 31.8	10 33.5	10 03.0	7	0.5	67	4.7	127	9.0
8	10 32.0	10 33.7	10 03.2	8	0.6	68	4.8	128	9.1
9	10 32.3	10 34.0	10 03.4	9	0.6	69	4.9	129	9.1
10	10 32.5	10 34.2	10 03.7	10	0.7	70	5.0	130	9.2
11	10 32.8	10 34.5	10 03.9	11	0.8	71	5.0	131	9.3
12	10 33.0	10 34.7	10 04.2	12	0.9	72	5.1	132	9.4
13	10 33.3	10 35.0	10 04.4	13	0.9	73	5.2	133	9.4
14	10 33.5	10 35.2	10 04.6	14	1.0	74	5.2	134	9.5
15	10 33.8	10 35.5	10 04.9	15	1.1	75	5.3	135	9.6
16	10 34.0	10 35.7	10 05.1	16	1.1	76	5.4	136	9.6
17	10 34.3	10 36.0	10 05.4	17	1.2	77	5.5	137	9.7
18	10 34.5	10 36.2	10 05.6	18	1.3	78	5.5	138	9.8
19	10 34.8	10 36.5	10 05.8	19	1.3	79	5.6	139	9.8
20	10 35.0	10 36.7	10 06.1	20	1.4	80	5.7	140	9.9
21	10 35.3	10 37.0	10 06.3	21	1.5	81	5.7	141	10.0
22	10 35.5	10 37.2	10 06.5	22	1.6	82	5.8	142	10.1
23	10 35.8	10 37.5	10 06.8	23	1.6	83	5.9	143	10.1
24	10 36.0	10 37.7	10 07.0	24	1.7	84	6.0	144	10.2
25	10 36.3	10 38.0	10 07.3	25	1.8	85	6.0	145	10.3
26	10 36.5	10 38.2	10 07.5	26	1.8	86	6.1	146	10.3
27	10 36.8	10 38.5	10 07.7	27	1.9	87	6.2	147	10.4
28	10 37.0	10 38.7	10 08.0	28	2.0	88	6.2	148	10.5
29	10 37.3	10 39.0	10 08.2	29	2.1	89	6.3	149	10.6
30	10 37.5	10 39.2	10 08.5	30	2.1	90	6.4	150	10.6
31	10 37.8	10 39.5	10 08.7	31	2.2	91	6.4	151	10.7
32	10 38.0	10 39.7	10 08.9	32	2.3	92	6.5	152	10.8
33	10 38.3	10 40.0	10 09.2	33	2.3	93	6.6	153	10.8
34	10 38.5	10 40.2	10 09.4	34	2.4	94	6.7	154	10.9
35	10 38.8	10 40.5	10 09.7	35	2.5	95	6.7	155	11.0
36	10 39.0	10 40.7	10 09.9	36	2.6	96	6.8	156	11.1
37	10 39.3	10 41.0	10 10.1	37	2.6	97	6.9	157	11.1
38	10 39.5	10 41.3	10 10.4	38	2.7	98	6.9	158	11.2
39	10 39.8	10 41.5	10 10.6	39	2.8	99	7.0	159	11.3
40	10 40.0	10 41.8	10 10.8	40	2.8	100	7.1	160	11.3
41	10 40.3	10 42.0	10 11.1	41	2.9	101	7.2	161	11.4
42	10 40.5	10 42.3	10 11.3	42	3.0	102	7.2	162	11.5
43	10 40.8	10 42.5	10 11.6	43	3.0	103	7.3	163	11.5
44	10 41.0	10 42.8	10 11.8	44	3.1	104	7.4	164	11.6
45	10 41.3	10 43.0	10 12.0	45	3.2	105	7.4	165	11.7
46	10 41.5	10 43.3	10 12.3	46	3.3	106	7.5	166	11.8
47	10 41.8	10 43.5	10 12.5	47	3.3	107	7.6	167	11.8
48	10 42.0	10 43.8	10 12.8	48	3.4	108	7.7	168	11.9
49	10 42.3	10 44.0	10 13.0	49	3.5	109	7.7	169	12.0
50	10 42.5	10 44.3	10 13.2	50	3.5	110	7.8	170	12.0
51	10 42.8	10 44.5	10 13.5	51	3.6	111	7.9	171	12.1
52	10 43.0	10 44.8	10 13.7	52	3.7	112	7.9	172	12.2
53	10 43.3	10 45.0	10 13.9	53	3.8	113	8.0	173	12.3
54	10 43.5	10 45.3	10 14.2	54	3.8	114	8.1	174	12.3
55	10 43.8	10 45.5	10 14.4	55	3.9	115	8.1	175	12.4
56	10 44.0	10 45.8	10 14.7	56	4.0	116	8.2	176	12.5
57	10 44.3	10 46.0	10 14.9	57	4.0	117	8.3	177	12.5
58	10 44.5	10 46.3	10 15.1	58	4.1	118	8.4	178	12.6
59	10 44.8	10 46.5	10 15.4	59	4.2	119	8.4	179	12.7
60	10 45.0	10 46.8	10 15.6	60	4.3	120	8.5	180	12.8

43m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	10 45.0	10 46.8	10 15.6	0	0.0	60	4.4	120	8.7
1	10 45.3	10 47.0	10 15.9	1	0.1	61	4.4	121	8.8
2	10 45.5	10 47.3	10 16.1	2	0.1	62	4.5	122	8.8
3	10 45.8	10 47.5	10 16.3	3	0.2	63	4.6	123	8.9
4	10 46.0	10 47.8	10 16.6	4	0.3	64	4.6	124	9.0
5	10 46.3	10 48.0	10 16.8	5	0.4	65	4.7	125	9.1
6	10 46.5	10 48.3	10 17.0	6	0.4	66	4.8	126	9.1
7	10 46.8	10 48.5	10 17.3	7	0.5	67	4.9	127	9.2
8	10 47.0	10 48.8	10 17.5	8	0.6	68	4.9	128	9.3
9	10 47.3	10 49.0	10 17.8	9	0.7	69	5.0	129	9.4
10	10 47.5	10 49.3	10 18.0	10	0.7	70	5.1	130	9.4
11	10 47.8	10 49.5	10 18.2	11	0.8	71	5.1	131	9.5
12	10 48.0	10 49.8	10 18.5	12	0.9	72	5.2	132	9.6
13	10 48.3	10 50.0	10 18.7	13	0.9	73	5.3	133	9.6
14	10 48.5	10 50.3	10 19.0	14	1.0	74	5.4	134	9.7
15	10 48.8	10 50.5	10 19.2	15	1.1	75	5.4	135	9.8
16	10 49.0	10 50.8	10 19.4	16	1.2	76	5.5	136	9.9
17	10 49.3	10 51.0	10 19.7	17	1.2	77	5.6	137	9.9
18	10 49.5	10 51.3	10 19.9	18	1.3	78	5.7	138	10.0
19	10 49.8	10 51.5	10 20.2	19	1.4	79	5.7	139	10.1
20	10 50.0	10 51.8	10 20.4	20	1.5	80	5.8	140	10.2
21	10 50.3	10 52.0	10 20.6	21	1.5	81	5.9	141	10.2
22	10 50.5	10 52.3	10 20.9	22	1.6	82	5.9	142	10.3
23	10 50.8	10 52.5	10 21.1	23	1.7	83	6.0	143	10.4
24	10 51.0	10 52.8	10 21.3	24	1.7	84	6.1	144	10.4
25	10 51.3	10 53.0	10 21.6	25	1.8	85	6.2	145	10.5
26	10 51.5	10 53.3	10 21.8	26	1.9	86	6.2	146	10.6
27	10 51.8	10 53.5	10 22.1	27	2.0	87	6.3	147	10.7
28	10 52.0	10 53.8	10 22.3	28	2.0	88	6.4	148	10.7
29	10 52.3	10 54.0	10 22.5	29	2.1	89	6.5	149	10.8
30	10 52.5	10 54.3	10 22.8	30	2.2	90	6.5	150	10.9
31	10 52.8	10 54.5	10 23.0	31	2.2	91	6.6	151	10.9
32	10 53.0	10 54.8	10 23.3	32	2.3	92	6.7	152	11.0
33	10 53.3	10 55.0	10 23.5	33	2.4	93	6.7	153	11.1
34	10 53.5	10 55.3	10 23.7	34	2.5	94	6.8	154	11.2
35	10 53.8	10 55.5	10 24.0	35	2.5	95	6.9	155	11.2
36	10 54.0	10 55.8	10 24.2	36	2.6	96	7.0	156	11.3
37	10 54.3	10 56.0	10 24.4	37	2.7	97	7.0	157	11.4
38	10 54.5	10 56.3	10 24.7	38	2.8	98	7.1	158	11.5
39	10 54.8	10 56.5	10 24.9	39	2.8	99	7.2	159	11.5
40	10 55.0	10 56.8	10 25.2	40	2.9	100	7.3	160	11.6
41	10 55.3	10 57.0	10 25.4	41	3.0	101	7.3	161	11.7
42	10 55.5	10 57.3	10 25.6	42	3.0	102	7.4	162	11.7
43	10 55.8	10 57.5	10 25.9	43	3.1	103	7.5	163	11.8
44	10 56.0	10 57.8	10 26.1	44	3.2	104	7.5	164	11.9
45	10 56.3	10 58.0	10 26.4	45	3.3	105	7.6	165	12.0
46	10 56.5	10 58.3	10 26.6	46	3.3	106	7.7	166	12.0
47	10 56.8	10 58.5	10 26.8	47	3.4	107	7.8	167	12.1
48	10 57.0	10 58.8	10 27.1	48	3.5	108	7.8	168	12.2
49	10 57.3	10 59.0	10 27.3	49	3.6	109	7.9	169	12.3
50	10 57.5	10 59.3	10 27.5	50	3.6	110	8.0	170	12.3
51	10 57.8	10 59.6	10 27.8	51	3.7	111	8.0	171	12.4
52	10 58.0	10 59.8	10 28.0	52	3.8	112	8.1	172	12.5
53	10 58.3	11 00.1	10 28.3	53	3.8	113	8.2	173	12.5
54	10 58.5	11 00.3	10 28.5	54	3.9	114	8.3	174	12.6
55	10 58.8	11 00.6	10 28.7	55	4.0	115	8.3	175	12.7
56	10 59.0	11 00.8	10 29.0	56	4.1	116	8.4	176	12.8
57	10 59.3	11 01.1	10 29.2	57	4.1	117	8.5	177	12.8
58	10 59.5	11 01.3	10 29.5	58	4.2	118	8.6	178	12.9
59	10 59.8	11 01.6	10 29.7	59	4.3	119	8.6	179	13.0
60	11 00.0	11 01.8	10 29.9	60	4.4	120	8.7	180	13.1

44m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	11 00.0	11 01.8	10 29.9	0	0.0	60	4.5	120	8.9
1	11 00.3	11 02.1	10 30.2	1	0.1	61	4.5	121	9.0
2	11 00.5	11 02.3	10 30.4	2	0.1	62	4.6	122	9.0
3	11 00.8	11 02.6	10 30.6	3	0.2	63	4.7	123	9.1
4	11 01.0	11 02.8	10 30.9	4	0.3	64	4.7	124	9.2
5	11 01.3	11 03.1	10 31.1	5	0.4	65	4.8	125	9.3
6	11 01.5	11 03.3	10 31.4	6	0.4	66	4.9	126	9.3
7	11 01.8	11 03.6	10 31.6	7	0.5	67	5.0	127	9.4
8	11 02.0	11 03.8	10 31.8	8	0.6	68	5.0	128	9.5
9	11 02.3	11 04.1	10 32.1	9	0.7	69	5.1	129	9.6
10	11 02.5	11 04.3	10 32.3	10	0.7	70	5.2	130	9.6
11	11 02.8	11 04.6	10 32.6	11	0.8	71	5.3	131	9.7
12	11 03.0	11 04.8	10 32.8	12	0.9	72	5.3	132	9.8
13	11 03.3	11 05.1	10 33.0	13	1.0	73	5.4	133	9.9
14	11 03.5	11 05.3	10 33.3	14	1.0	74	5.5	134	9.9
15	11 03.8	11 05.6	10 33.5	15	1.1	75	5.6	135	10.0
16	11 04.0	11 05.8	10 33.8	16	1.2	76	5.6	136	10.1
17	11 04.3	11 06.1	10 34.0	17	1.3	77	5.7	137	10.2
18	11 04.5	11 06.3	10 34.2	18	1.3	78	5.8	138	10.2
19	11 04.8	11 06.6	10 34.5	19	1.4	79	5.9	139	10.3
20	11 05.0	11 06.8	10 34.7	20	1.5	80	5.9	140	10.4
21	11 05.3	11 07.1	10 34.9	21	1.6	81	6.0	141	10.5
22	11 05.5	11 07.3	10 35.2	22	1.6	82	6.1	142	10.5
23	11 05.8	11 07.6	10 35.4	23	1.7	83	6.2	143	10.6
24	11 06.0	11 07.8	10 35.7	24	1.8	84	6.2	144	10.7
25	11 06.3	11 08.1	10 35.9	25	1.9	85	6.3	145	10.8
26	11 06.5	11 08.3	10 36.1	26	1.9	86	6.4	146	10.8
27	11 06.8	11 08.6	10 36.4	27	2.0	87	6.5	147	10.9
28	11 07.0	11 08.8	10 36.6	28	2.1	88	6.5	148	11.0
29	11 07.3	11 09.1	10 36.9	29	2.2	89	6.6	149	11.1
30	11 07.5	11 09.3	10 37.1	30	2.2	90	6.7	150	11.1
31	11 07.8	11 09.6	10 37.3	31	2.3	91	6.7	151	11.2
32	11 08.0	11 09.8	10 37.6	32	2.4	92	6.8	152	11.3
33	11 08.3	11 10.1	10 37.8	33	2.4	93	6.9	153	11.3
34	11 08.5	11 10.3	10 38.0	34	2.5	94	7.0	154	11.4
35	11 08.8	11 10.6	10 38.3	35	2.6	95	7.0	155	11.5
36	11 09.0	11 10.8	10 38.5	36	2.7	96	7.1	156	11.6
37	11 09.3	11 11.1	10 38.8	37	2.7	97	7.2	157	11.6
38	11 09.5	11 11.3	10 39.0	38	2.8	98	7.3	158	11.7
39	11 09.8	11 11.6	10 39.2	39	2.9	99	7.3	159	11.8
40	11 10.0	11 11.8	10 39.5	40	3.0	100	7.4	160	11.9
41	11 10.3	11 12.1	10 39.7	41	3.0	101	7.5	161	11.9
42	11 10.5	11 12.3	10 40.0	42	3.1	102	7.6	162	12.0
43	11 10.8	11 12.6	10 40.2	43	3.2	103	7.6	163	12.1
44	11 11.0	11 12.8	10 40.4	44	3.3	104	7.7	164	12.2
45	11 11.3	11 13.1	10 40.7	45	3.3	105	7.8	165	12.2
46	11 11.5	11 13.3	10 40.9	46	3.4	106	7.9	166	12.3
47	11 11.8	11 13.6	10 41.1	47	3.5	107	7.9	167	12.4
48	11 12.0	11 13.8	10 41.4	48	3.6	108	8.0	168	12.5
49	11 12.3	11 14.1	10 41.6	49	3.6	109	8.1	169	12.5
50	11 12.5	11 14.3	10 41.9	50	3.7	110	8.2	170	12.6
51	11 12.8	11 14.6	10 42.1	51	3.8	111	8.2	171	12.7
52	11 13.0	11 14.8	10 42.3	52	3.9	112	8.3	172	12.8
53	11 13.3	11 15.1	10 42.6	53	3.9	113	8.4	173	12.8
54	11 13.5	11 15.3	10 42.8	54	4.0	114	8.5	174	12.9
55	11 13.8	11 15.6	10 43.1	55	4.1	115	8.5	175	13.0
56	11 14.0	11 15.8	10 43.3	56	4.2	116	8.6	176	13.1
57	11 14.3	11 16.1	10 43.5	57	4.2	117	8.7	177	13.1
58	11 14.5	11 16.3	10 43.8	58	4.3	118	8.8	178	13.2
59	11 14.8	11 16.6	10 44.0	59	4.4	119	8.8	179	13.3
60	11 15.0	11 16.8	10 44.3	60	4.5	120	8.9	180	13.4

45m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	11 15.0	11 16.8	10 44.3	0	0.0	60	4.6	120	9.1
1	11 15.3	11 17.1	10 44.5	1	0.1	61	4.6	121	9.2
2	11 15.5	11 17.3	10 44.7	2	0.2	62	4.7	122	9.3
3	11 15.8	11 17.6	10 45.0	3	0.2	63	4.8	123	9.3
4	11 16.0	11 17.9	10 45.2	4	0.3	64	4.9	124	9.4
5	11 16.3	11 18.1	10 45.4	5	0.4	65	4.9	125	9.5
6	11 16.5	11 18.4	10 45.7	6	0.5	66	5.0	126	9.6
7	11 16.8	11 18.6	10 45.9	7	0.5	67	5.1	127	9.6
8	11 17.0	11 18.9	10 46.2	8	0.6	68	5.2	128	9.7
9	11 17.3	11 19.1	10 46.4	9	0.7	69	5.2	129	9.8
10	11 17.5	11 19.4	10 46.6	10	0.8	70	5.3	130	9.9
11	11 17.8	11 19.6	10 46.9	11	0.8	71	5.4	131	9.9
12	11 18.0	11 19.9	10 47.1	12	0.9	72	5.5	132	10.0
13	11 18.3	11 20.1	10 47.4	13	1.0	73	5.5	133	10.1
14	11 18.5	11 20.4	10 47.6	14	1.1	74	5.6	134	10.2
15	11 18.8	11 20.6	10 47.8	15	1.1	75	5.7	135	10.2
16	11 19.0	11 20.9	10 48.1	16	1.2	76	5.8	136	10.3
17	11 19.3	11 21.1	10 48.3	17	1.3	77	5.8	137	10.4
18	11 19.5	11 21.4	10 48.5	18	1.4	78	5.9	138	10.5
19	11 19.8	11 21.6	10 48.8	19	1.4	79	6.0	139	10.5
20	11 20.0	11 21.9	10 49.0	20	1.5	80	6.1	140	10.6
21	11 20.3	11 22.1	10 49.3	21	1.6	81	6.1	141	10.7
22	11 20.5	11 22.4	10 49.5	22	1.7	82	6.2	142	10.8
23	11 20.8	11 22.6	10 49.7	23	1.7	83	6.3	143	10.8
24	11 21.0	11 22.9	10 50.0	24	1.8	84	6.4	144	10.9
25	11 21.3	11 23.1	10 50.2	25	1.9	85	6.4	145	11.0
26	11 21.5	11 23.4	10 50.5	26	2.0	86	6.5	146	11.1
27	11 21.8	11 23.6	10 50.7	27	2.0	87	6.6	147	11.1
28	11 22.0	11 23.9	10 50.9	28	2.1	88	6.7	148	11.2
29	11 22.3	11 24.1	10 51.2	29	2.2	89	6.7	149	11.3
30	11 22.5	11 24.4	10 51.4	30	2.3	90	6.8	150	11.4
31	11 22.8	11 24.6	10 51.6	31	2.4	91	6.9	151	11.5
32	11 23.0	11 24.9	10 51.9	32	2.4	92	7.0	152	11.5
33	11 23.3	11 25.1	10 52.1	33	2.5	93	7.1	153	11.6
34	11 23.5	11 25.4	10 52.4	34	2.6	94	7.1	154	11.7
35	11 23.8	11 25.6	10 52.6	35	2.7	95	7.2	155	11.8
36	11 24.0	11 25.9	10 52.8	36	2.7	96	7.3	156	11.8
37	11 24.3	11 26.1	10 53.1	37	2.8	97	7.4	157	11.9
38	11 24.5	11 26.4	10 53.3	38	2.9	98	7.4	158	12.0
39	11 24.8	11 26.6	10 53.6	39	3.0	99	7.5	159	12.1
40	11 25.0	11 26.9	10 53.8	40	3.0	100	7.6	160	12.1
41	11 25.3	11 27.1	10 54.0	41	3.1	101	7.7	161	12.2
42	11 25.5	11 27.4	10 54.3	42	3.2	102	7.7	162	12.3
43	11 25.8	11 27.6	10 54.5	43	3.3	103	7.8	163	12.4
44	11 26.0	11 27.9	10 54.7	44	3.3	104	7.9	164	12.4
45	11 26.3	11 28.1	10 55.0	45	3.4	105	8.0	165	12.5
46	11 26.5	11 28.4	10 55.2	46	3.5	106	8.0	166	12.6
47	11 26.8	11 28.6	10 55.5	47	3.6	107	8.1	167	12.7
48	11 27.0	11 28.9	10 55.7	48	3.6	108	8.2	168	12.7
49	11 27.3	11 29.1	10 55.9	49	3.7	109	8.3	169	12.8
50	11 27.5	11 29.4	10 56.2	50	3.8	110	8.3	170	12.9
51	11 27.8	11 29.6	10 56.4	51	3.9	111	8.4	171	13.0
52	11 28.0	11 29.9	10 56.7	52	3.9	112	8.5	172	13.0
53	11 28.3	11 30.1	10 56.9	53	4.0	113	8.6	173	13.1
54	11 28.5	11 30.4	10 57.1	54	4.1	114	8.6	174	13.2
55	11 28.8	11 30.6	10 57.4	55	4.2	115	8.7	175	13.3
56	11 29.0	11 30.9	10 57.6	56	4.2	116	8.8	176	13.3
57	11 29.3	11 31.1	10 57.9	57	4.3	117	8.9	177	13.4
58	11 29.5	11 31.4	10 58.1	58	4.4	118	8.9	178	13.5
59	11 29.8	11 31.6	10 58.3	59	4.5	119	9.0	179	13.6
60	11 30.0	11 31.9	10 58.6	60	4.6	120	9.1	180	13.7

46m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	11 30.0	11 31.9	10 58.6	0	0.0	60	4.7	120	9.3
1	11 30.3	11 32.1	10 58.8	1	0.1	61	4.7	121	9.4
2	11 30.5	11 32.4	10 59.0	2	0.2	62	4.8	122	9.5
3	11 30.8	11 32.6	10 59.3	3	0.2	63	4.9	123	9.5
4	11 31.0	11 32.9	10 59.5	4	0.3	64	5.0	124	9.6
5	11 31.3	11 33.1	10 59.8	5	0.4	65	5.0	125	9.7
6	11 31.5	11 33.4	11 00.0	6	0.5	66	5.1	126	9.8
7	11 31.8	11 33.6	11 00.2	7	0.5	67	5.2	127	9.8
8	11 32.0	11 33.9	11 00.5	8	0.6	68	5.3	128	9.9
9	11 32.3	11 34.1	11 00.7	9	0.7	69	5.3	129	10.0
10	11 32.5	11 34.4	11 01.0	10	0.8	70	5.4	130	10.1
11	11 32.8	11 34.6	11 01.2	11	0.9	71	5.5	131	10.2
12	11 33.0	11 34.9	11 01.4	12	0.9	72	5.6	132	10.2
13	11 33.3	11 35.1	11 01.7	13	1.0	73	5.7	133	10.3
14	11 33.5	11 35.4	11 01.9	14	1.1	74	5.7	134	10.4
15	11 33.8	11 35.6	11 02.1	15	1.2	75	5.8	135	10.5
16	11 34.0	11 35.9	11 02.4	16	1.2	76	5.9	136	10.5
17	11 34.3	11 36.2	11 02.6	17	1.3	77	6.0	137	10.6
18	11 34.5	11 36.4	11 02.9	18	1.4	78	6.0	138	10.7
19	11 34.8	11 36.7	11 03.1	19	1.5	79	6.1	139	10.8
20	11 35.0	11 36.9	11 03.3	20	1.6	80	6.2	140	10.9
21	11 35.3	11 37.2	11 03.6	21	1.6	81	6.3	141	10.9
22	11 35.5	11 37.4	11 03.8	22	1.7	82	6.4	142	11.0
23	11 35.8	11 37.7	11 04.1	23	1.8	83	6.4	143	11.1
24	11 36.0	11 37.9	11 04.3	24	1.9	84	6.5	144	11.2
25	11 36.3	11 38.2	11 04.5	25	1.9	85	6.6	145	11.2
26	11 36.5	11 38.4	11 04.8	26	2.0	86	6.7	146	11.3
27	11 36.8	11 38.7	11 05.0	27	2.1	87	6.7	147	11.4
28	11 37.0	11 38.9	11 05.2	28	2.2	88	6.8	148	11.5
29	11 37.3	11 39.2	11 05.5	29	2.2	89	6.9	149	11.5
30	11 37.5	11 39.4	11 05.7	30	2.3	90	7.0	150	11.6
31	11 37.8	11 39.7	11 06.0	31	2.4	91	7.1	151	11.7
32	11 38.0	11 39.9	11 06.2	32	2.5	92	7.1	152	11.8
33	11 38.3	11 40.2	11 06.4	33	2.6	93	7.2	153	11.9
34	11 38.5	11 40.4	11 06.7	34	2.6	94	7.3	154	11.9
35	11 38.8	11 40.7	11 06.9	35	2.7	95	7.4	155	12.0
36	11 39.0	11 40.9	11 07.2	36	2.8	96	7.4	156	12.1
37	11 39.3	11 41.2	11 07.4	37	2.9	97	7.5	157	12.2
38	11 39.5	11 41.4	11 07.6	38	2.9	98	7.6	158	12.2
39	11 39.8	11 41.7	11 07.9	39	3.0	99	7.7	159	12.3
40	11 40.0	11 41.9	11 08.1	40	3.1	100	7.8	160	12.4
41	11 40.3	11 42.2	11 08.3	41	3.2	101	7.8	161	12.5
42	11 40.5	11 42.4	11 08.6	42	3.3	102	7.9	162	12.6
43	11 40.8	11 42.7	11 08.8	43	3.3	103	8.0	163	12.6
44	11 41.0	11 42.9	11 09.1	44	3.4	104	8.1	164	12.7
45	11 41.3	11 43.2	11 09.3	45	3.5	105	8.1	165	12.8
46	11 41.5	11 43.4	11 09.5	46	3.6	106	8.2	166	12.9
47	11 41.8	11 43.7	11 09.8	47	3.6	107	8.3	167	12.9
48	11 42.0	11 43.9	11 10.0	48	3.7	108	8.4	168	13.0
49	11 42.3	11 44.2	11 10.3	49	3.8	109	8.4	169	13.1
50	11 42.5	11 44.4	11 10.5	50	3.9	110	8.5	170	13.2
51	11 42.8	11 44.7	11 10.7	51	4.0	111	8.6	171	13.3
52	11 43.0	11 44.9	11 11.0	52	4.0	112	8.7	172	13.3
53	11 43.3	11 45.2	11 11.2	53	4.1	113	8.8	173	13.4
54	11 43.5	11 45.4	11 11.5	54	4.2	114	8.8	174	13.5
55	11 43.8	11 45.7	11 11.7	55	4.3	115	8.9	175	13.6
56	11 44.0	11 45.9	11 11.9	56	4.3	116	9.0	176	13.6
57	11 44.3	11 46.2	11 12.2	57	4.4	117	9.1	177	13.7
58	11 44.5	11 46.4	11 12.4	58	4.5	118	9.1	178	13.8
59	11 44.8	11 46.7	11 12.6	59	4.6	119	9.2	179	13.9
60	11 45.0	11 46.9	11 12.9	60	4.7	120	9.3	180	14.0

47m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	11 45.0	11 46.9	11 12.9	0	0.0	60	4.8	120	9.5
1	11 45.3	11 47.2	11 13.1	1	0.1	61	4.8	121	9.6
2	11 45.5	11 47.4	11 13.4	2	0.2	62	4.9	122	9.7
3	11 45.8	11 47.7	11 13.6	3	0.2	63	5.0	123	9.7
4	11 46.0	11 47.9	11 13.8	4	0.3	64	5.1	124	9.8
5	11 46.3	11 48.2	11 14.1	5	0.4	65	5.1	125	9.9
6	11 46.5	11 48.4	11 14.3	6	0.5	66	5.2	126	10.0
7	11 46.8	11 48.7	11 14.6	7	0.6	67	5.3	127	10.1
8	11 47.0	11 48.9	11 14.8	8	0.6	68	5.4	128	10.1
9	11 47.3	11 49.2	11 15.0	9	0.7	69	5.5	129	10.2
10	11 47.5	11 49.4	11 15.3	10	0.8	70	5.5	130	10.3
11	11 47.8	11 49.7	11 15.5	11	0.9	71	5.6	131	10.4
12	11 48.0	11 49.9	11 15.7	12	1.0	72	5.7	132	10.5
13	11 48.3	11 50.2	11 16.0	13	1.0	73	5.8	133	10.5
14	11 48.5	11 50.4	11 16.2	14	1.1	74	5.9	134	10.6
15	11 48.8	11 50.7	11 16.5	15	1.2	75	5.9	135	10.7
16	11 49.0	11 50.9	11 16.7	16	1.3	76	6.0	136	10.8
17	11 49.3	11 51.2	11 16.9	17	1.3	77	6.1	137	10.8
18	11 49.5	11 51.4	11 17.2	18	1.4	78	6.2	138	10.9
19	11 49.8	11 51.7	11 17.4	19	1.5	79	6.3	139	11.0
20	11 50.0	11 51.9	11 17.7	20	1.6	80	6.3	140	11.1
21	11 50.3	11 52.2	11 17.9	21	1.7	81	6.4	141	11.2
22	11 50.5	11 52.4	11 18.1	22	1.7	82	6.5	142	11.2
23	11 50.8	11 52.7	11 18.4	23	1.8	83	6.6	143	11.3
24	11 51.0	11 52.9	11 18.6	24	1.9	84	6.7	144	11.4
25	11 51.3	11 53.2	11 18.8	25	2.0	85	6.7	145	11.5
26	11 51.5	11 53.4	11 19.1	26	2.1	86	6.8	146	11.6
27	11 51.8	11 53.7	11 19.3	27	2.1	87	6.9	147	11.6
28	11 52.0	11 53.9	11 19.6	28	2.2	88	7.0	148	11.7
29	11 52.3	11 54.2	11 19.8	29	2.3	89	7.0	149	11.8
30	11 52.5	11 54.5	11 20.0	30	2.4	90	7.1	150	11.9
31	11 52.8	11 54.7	11 20.3	31	2.5	91	7.2	151	12.0
32	11 53.0	11 55.0	11 20.5	32	2.5	92	7.3	152	12.0
33	11 53.3	11 55.2	11 20.8	33	2.6	93	7.4	153	12.1
34	11 53.5	11 55.5	11 21.0	34	2.7	94	7.4	154	12.2
35	11 53.8	11 55.7	11 21.2	35	2.8	95	7.5	155	12.3
36	11 54.0	11 56.0	11 21.5	36	2.9	96	7.6	156	12.4
37	11 54.3	11 56.2	11 21.7	37	2.9	97	7.7	157	12.4
38	11 54.5	11 56.5	11 22.0	38	3.0	98	7.8	158	12.5
39	11 54.8	11 56.7	11 22.2	39	3.1	99	7.8	159	12.6
40	11 55.0	11 57.0	11 22.4	40	3.2	100	7.9	160	12.7
41	11 55.3	11 57.2	11 22.7	41	3.2	101	8.0	161	12.7
42	11 55.5	11 57.5	11 22.9	42	3.3	102	8.1	162	12.8
43	11 55.8	11 57.7	11 23.1	43	3.4	103	8.2	163	12.9
44	11 56.0	11 58.0	11 23.4	44	3.5	104	8.2	164	13.0
45	11 56.3	11 58.2	11 23.6	45	3.6	105	8.3	165	13.1
46	11 56.5	11 58.5	11 23.9	46	3.6	106	8.4	166	13.1
47	11 56.8	11 58.7	11 24.1	47	3.7	107	8.5	167	13.2
48	11 57.0	11 59.0	11 24.3	48	3.8	108	8.6	168	13.3
49	11 57.3	11 59.2	11 24.6	49	3.9	109	8.6	169	13.4
50	11 57.5	11 59.5	11 24.8	50	4.0	110	8.7	170	13.5
51	11 57.8	11 59.7	11 25.1	51	4.0	111	8.8	171	13.5
52	11 58.0	12 00.0	11 25.3	52	4.1	112	8.9	172	13.6
53	11 58.3	12 00.2	11 25.5	53	4.2	113	8.9	173	13.7
54	11 58.5	12 00.5	11 25.8	54	4.3	114	9.0	174	13.8
55	11 58.8	12 00.7	11 26.0	55	4.4	115	9.1	175	13.9
56	11 59.0	12 01.0	11 26.2	56	4.4	116	9.2	176	13.9
57	11 59.3	12 01.2	11 26.5	57	4.5	117	9.3	177	14.0
58	11 59.5	12 01.5	11 26.7	58	4.6	118	9.3	178	14.1
59	11 59.8	12 01.7	11 27.0	59	4.7	119	9.4	179	14.2
60	12 00.0	12 02.0	11 27.2	60	4.8	120	9.5	180	14.3

48m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	12 00.0	12 02.0	11 27.2	0	0.0	60	4.9	120	9.7
1	12 00.3	12 02.2	11 27.4	1	0.1	61	4.9	121	9.8
2	12 00.5	12 02.5	11 27.7	2	0.2	62	5.0	122	9.9
3	12 00.8	12 02.7	11 27.9	3	0.2	63	5.1	123	9.9
4	12 01.0	12 03.0	11 28.2	4	0.3	64	5.2	124	10.0
5	12 01.3	12 03.2	11 28.4	5	0.4	65	5.3	125	10.1
6	12 01.5	12 03.5	11 28.6	6	0.5	66	5.3	126	10.2
7	12 01.8	12 03.7	11 28.9	7	0.6	67	5.4	127	10.3
8	12 02.0	12 04.0	11 29.1	8	0.6	68	5.5	128	10.3
9	12 02.3	12 04.2	11 29.3	9	0.7	69	5.6	129	10.4
10	12 02.5	12 04.5	11 29.6	10	0.8	70	5.7	130	10.5
11	12 02.8	12 04.7	11 29.8	11	0.9	71	5.7	131	10.6
12	12 03.0	12 05.0	11 30.1	12	1.0	72	5.8	132	10.7
13	12 03.3	12 05.2	11 30.3	13	1.1	73	5.9	133	10.8
14	12 03.5	12 05.5	11 30.5	14	1.1	74	6.0	134	10.8
15	12 03.8	12 05.7	11 30.8	15	1.2	75	6.1	135	10.9
16	12 04.0	12 06.0	11 31.0	16	1.3	76	6.1	136	11.0
17	12 04.3	12 06.2	11 31.3	17	1.4	77	6.2	137	11.1
18	12 04.5	12 06.5	11 31.5	18	1.5	78	6.3	138	11.2
19	12 04.8	12 06.7	11 31.7	19	1.5	79	6.4	139	11.2
20	12 05.0	12 07.0	11 32.0	20	1.6	80	6.5	140	11.3
21	12 05.3	12 07.2	11 32.2	21	1.7	81	6.5	141	11.4
22	12 05.5	12 07.5	11 32.4	22	1.8	82	6.6	142	11.5
23	12 05.8	12 07.7	11 32.7	23	1.9	83	6.7	143	11.6
24	12 06.0	12 08.0	11 32.9	24	1.9	84	6.8	144	11.6
25	12 06.3	12 08.2	11 33.2	25	2.0	85	6.9	145	11.7
26	12 06.5	12 08.5	11 33.4	26	2.1	86	7.0	146	11.8
27	12 06.8	12 08.7	11 33.6	27	2.2	87	7.0	147	11.9
28	12 07.0	12 09.0	11 33.9	28	2.3	88	7.1	148	12.0
29	12 07.3	12 09.2	11 34.1	29	2.3	89	7.2	149	12.0
30	12 07.5	12 09.5	11 34.4	30	2.4	90	7.3	150	12.1
31	12 07.8	12 09.7	11 34.6	31	2.5	91	7.4	151	12.2
32	12 08.0	12 10.0	11 34.8	32	2.6	92	7.4	152	12.3
33	12 08.3	12 10.2	11 35.1	33	2.7	93	7.5	153	12.4
34	12 08.5	12 10.5	11 35.3	34	2.7	94	7.6	154	12.4
35	12 08.8	12 10.7	11 35.6	35	2.8	95	7.7	155	12.5
36	12 09.0	12 11.0	11 35.8	36	2.9	96	7.8	156	12.6
37	12 09.3	12 11.2	11 36.0	37	3.0	97	7.8	157	12.7
38	12 09.5	12 11.5	11 36.3	38	3.1	98	7.9	158	12.8
39	12 09.8	12 11.7	11 36.5	39	3.2	99	8.0	159	12.9
40	12 10.0	12 12.0	11 36.7	40	3.2	100	8.1	160	12.9
41	12 10.3	12 12.2	11 37.0	41	3.3	101	8.2	161	13.0
42	12 10.5	12 12.5	11 37.2	42	3.4	102	8.2	162	13.1
43	12 10.8	12 12.8	11 37.5	43	3.5	103	8.3	163	13.2
44	12 11.0	12 13.0	11 37.7	44	3.6	104	8.4	164	13.3
45	12 11.3	12 13.3	11 37.9	45	3.6	105	8.5	165	13.3
46	12 11.5	12 13.5	11 38.2	46	3.7	106	8.6	166	13.4
47	12 11.8	12 13.8	11 38.4	47	3.8	107	8.6	167	13.5
48	12 12.0	12 14.0	11 38.7	48	3.9	108	8.7	168	13.6
49	12 12.3	12 14.3	11 38.9	49	4.0	109	8.8	169	13.7
50	12 12.5	12 14.5	11 39.1	50	4.0	110	8.9	170	13.7
51	12 12.8	12 14.8	11 39.4	51	4.1	111	9.0	171	13.8
52	12 13.0	12 15.0	11 39.6	52	4.2	112	9.1	172	13.9
53	12 13.3	12 15.3	11 39.8	53	4.3	113	9.1	173	14.0
54	12 13.5	12 15.5	11 40.1	54	4.4	114	9.2	174	14.1
55	12 13.8	12 15.8	11 40.3	55	4.4	115	9.3	175	14.1
56	12 14.0	12 16.0	11 40.6	56	4.5	116	9.4	176	14.2
57	12 14.3	12 16.3	11 40.8	57	4.6	117	9.5	177	14.3
58	12 14.5	12 16.5	11 41.0	58	4.7	118	9.5	178	14.4
59	12 14.8	12 16.8	11 41.3	59	4.8	119	9.6	179	14.5
60	12 15.0	12 17.0	11 41.5	60	4.9	120	9.7	180	14.6

49m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	12 15.0	12 17.0	11 41.5	0	0.0	60	5.0	120	9.9
1	12 15.3	12 17.3	11 41.8	1	0.1	61	5.0	121	10.0
2	12 15.5	12 17.5	11 42.0	2	0.2	62	5.1	122	10.1
3	12 15.8	12 17.8	11 42.2	3	0.2	63	5.2	123	10.1
4	12 16.0	12 18.0	11 42.5	4	0.3	64	5.3	124	10.2
5	12 16.3	12 18.3	11 42.7	5	0.4	65	5.4	125	10.3
6	12 16.5	12 18.5	11 42.9	6	0.5	66	5.4	126	10.4
7	12 16.8	12 18.8	11 43.2	7	0.6	67	5.5	127	10.5
8	12 17.0	12 19.0	11 43.4	8	0.7	68	5.6	128	10.6
9	12 17.3	12 19.3	11 43.7	9	0.7	69	5.7	129	10.6
10	12 17.5	12 19.5	11 43.9	10	0.8	70	5.8	130	10.7
11	12 17.8	12 19.8	11 44.1	11	0.9	71	5.9	131	10.8
12	12 18.0	12 20.0	11 44.4	12	1.0	72	5.9	132	10.9
13	12 18.3	12 20.3	11 44.6	13	1.1	73	6.0	133	11.0
14	12 18.5	12 20.5	11 44.9	14	1.2	74	6.1	134	11.1
15	12 18.8	12 20.8	11 45.1	15	1.2	75	6.2	135	11.1
16	12 19.0	12 21.0	11 45.3	16	1.3	76	6.3	136	11.2
17	12 19.3	12 21.3	11 45.6	17	1.4	77	6.4	137	11.3
18	12 19.5	12 21.5	11 45.8	18	1.5	78	6.4	138	11.4
19	12 19.8	12 21.8	11 46.1	19	1.6	79	6.5	139	11.5
20	12 20.0	12 22.0	11 46.3	20	1.7	80	6.6	140	11.6
21	12 20.3	12 22.3	11 46.5	21	1.7	81	6.7	141	11.6
22	12 20.5	12 22.5	11 46.8	22	1.8	82	6.8	142	11.7
23	12 20.8	12 22.8	11 47.0	23	1.9	83	6.8	143	11.8
24	12 21.0	12 23.0	11 47.2	24	2.0	84	6.9	144	11.9
25	12 21.3	12 23.3	11 47.5	25	2.1	85	7.0	145	12.0
26	12 21.5	12 23.5	11 47.7	26	2.1	86	7.1	146	12.0
27	12 21.8	12 23.8	11 48.0	27	2.2	87	7.2	147	12.1
28	12 22.0	12 24.0	11 48.2	28	2.3	88	7.3	148	12.2
29	12 22.3	12 24.3	11 48.4	29	2.4	89	7.3	149	12.3
30	12 22.5	12 24.5	11 48.7	30	2.5	90	7.4	150	12.4
31	12 22.8	12 24.8	11 48.9	31	2.6	91	7.5	151	12.5
32	12 23.0	12 25.0	11 49.2	32	2.6	92	7.6	152	12.5
33	12 23.3	12 25.3	11 49.4	33	2.7	93	7.7	153	12.6
34	12 23.5	12 25.5	11 49.6	34	2.8	94	7.8	154	12.7
35	12 23.8	12 25.8	11 49.9	35	2.9	95	7.8	155	12.8
36	12 24.0	12 26.0	11 50.1	36	3.0	96	7.9	156	12.9
37	12 24.3	12 26.3	11 50.3	37	3.1	97	8.0	157	13.0
38	12 24.5	12 26.5	11 50.6	38	3.1	98	8.1	158	13.0
39	12 24.8	12 26.8	11 50.8	39	3.2	99	8.2	159	13.1
40	12 25.0	12 27.0	11 51.1	40	3.3	100	8.3	160	13.2
41	12 25.3	12 27.3	11 51.3	41	3.4	101	8.3	161	13.3
42	12 25.5	12 27.5	11 51.5	42	3.5	102	8.4	162	13.4
43	12 25.8	12 27.8	11 51.8	43	3.5	103	8.5	163	13.4
44	12 26.0	12 28.0	11 52.0	44	3.6	104	8.6	164	13.5
45	12 26.3	12 28.3	11 52.3	45	3.7	105	8.7	165	13.6
46	12 26.5	12 28.5	11 52.5	46	3.8	106	8.7	166	13.7
47	12 26.8	12 28.8	11 52.7	47	3.9	107	8.8	167	13.8
48	12 27.0	12 29.0	11 53.0	48	4.0	108	8.9	168	13.9
49	12 27.3	12 29.3	11 53.2	49	4.0	109	9.0	169	13.9
50	12 27.5	12 29.5	11 53.4	50	4.1	110	9.1	170	14.0
51	12 27.8	12 29.8	11 53.7	51	4.2	111	9.2	171	14.1
52	12 28.0	12 30.0	11 53.9	52	4.3	112	9.2	172	14.2
53	12 28.3	12 30.3	11 54.2	53	4.4	113	9.3	173	14.3
54	12 28.5	12 30.5	11 54.4	54	4.5	114	9.4	174	14.4
55	12 28.8	12 30.8	11 54.6	55	4.5	115	9.5	175	14.4
56	12 29.0	12 31.1	11 54.9	56	4.6	116	9.6	176	14.5
57	12 29.3	12 31.3	11 55.1	57	4.7	117	9.7	177	14.6
58	12 29.5	12 31.6	11 55.4	58	4.8	118	9.7	178	14.7
59	12 29.8	12 31.8	11 55.6	59	4.9	119	9.8	179	14.8
60	12 30.0	12 32.1	11 55.8	60	5.0	120	9.9	180	14.9

50m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	12 30.0	12 32.1	11 55.8	0	0.0	60	5.1	120	10.1
1	12 30.3	12 32.3	11 56.1	1	0.1	61	5.1	121	10.2
2	12 30.5	12 32.6	11 56.3	2	0.2	62	5.2	122	10.3
3	12 30.8	12 32.8	11 56.5	3	0.3	63	5.3	123	10.4
4	12 31.0	12 33.1	11 56.8	4	0.3	64	5.4	124	10.4
5	12 31.3	12 33.3	11 57.0	5	0.4	65	5.5	125	10.5
6	12 31.5	12 33.6	11 57.3	6	0.5	66	5.6	126	10.6
7	12 31.8	12 33.8	11 57.5	7	0.6	67	5.6	127	10.7
8	12 32.0	12 34.1	11 57.7	8	0.7	68	5.7	128	10.8
9	12 32.3	12 34.3	11 58.0	9	0.8	69	5.8	129	10.9
10	12 32.5	12 34.6	11 58.2	10	0.8	70	5.9	130	10.9
11	12 32.8	12 34.8	11 58.5	11	0.9	71	6.0	131	11.0
12	12 33.0	12 35.1	11 58.7	12	1.0	72	6.1	132	11.1
13	12 33.3	12 35.3	11 58.9	13	1.1	73	6.1	133	11.2
14	12 33.5	12 35.6	11 59.2	14	1.2	74	6.2	134	11.3
15	12 33.8	12 35.8	11 59.4	15	1.3	75	6.3	135	11.4
16	12 34.0	12 36.1	11 59.7	16	1.3	76	6.4	136	11.4
17	12 34.3	12 36.3	11 59.9	17	1.4	77	6.5	137	11.5
18	12 34.5	12 36.6	12 00.1	18	1.5	78	6.6	138	11.6
19	12 34.8	12 36.8	12 00.4	19	1.6	79	6.6	139	11.7
20	12 35.0	12 37.1	12 00.6	20	1.7	80	6.7	140	11.8
21	12 35.3	12 37.3	12 00.8	21	1.8	81	6.8	141	11.9
22	12 35.5	12 37.6	12 01.1	22	1.9	82	6.9	142	12.0
23	12 35.8	12 37.8	12 01.3	23	1.9	83	7.0	143	12.0
24	12 36.0	12 38.1	12 01.6	24	2.0	84	7.1	144	12.1
25	12 36.3	12 38.3	12 01.8	25	2.1	85	7.2	145	12.2
26	12 36.5	12 38.6	12 02.0	26	2.2	86	7.2	146	12.3
27	12 36.8	12 38.8	12 02.3	27	2.3	87	7.3	147	12.4
28	12 37.0	12 39.1	12 02.5	28	2.4	88	7.4	148	12.5
29	12 37.3	12 39.3	12 02.8	29	2.4	89	7.5	149	12.5
30	12 37.5	12 39.6	12 03.0	30	2.5	90	7.6	150	12.6
31	12 37.8	12 39.8	12 03.2	31	2.6	91	7.7	151	12.7
32	12 38.0	12 40.1	12 03.5	32	2.7	92	7.7	152	12.8
33	12 38.3	12 40.3	12 03.7	33	2.8	93	7.8	153	12.9
34	12 38.5	12 40.6	12 03.9	34	2.9	94	7.9	154	13.0
35	12 38.8	12 40.8	12 04.2	35	2.9	95	8.0	155	13.0
36	12 39.0	12 41.1	12 04.4	36	3.0	96	8.1	156	13.1
37	12 39.3	12 41.3	12 04.7	37	3.1	97	8.2	157	13.2
38	12 39.5	12 41.6	12 04.9	38	3.2	98	8.2	158	13.3
39	12 39.8	12 41.8	12 05.1	39	3.3	99	8.3	159	13.4
40	12 40.0	12 42.1	12 05.4	40	3.4	100	8.4	160	13.5
41	12 40.3	12 42.3	12 05.6	41	3.5	101	8.5	161	13.6
42	12 40.5	12 42.6	12 05.9	42	3.5	102	8.6	162	13.6
43	12 40.8	12 42.8	12 06.1	43	3.6	103	8.7	163	13.7
44	12 41.0	12 43.1	12 06.3	44	3.7	104	8.8	164	13.8
45	12 41.3	12 43.3	12 06.6	45	3.8	105	8.8	165	13.9
46	12 41.5	12 43.6	12 06.8	46	3.9	106	8.9	166	14.0
47	12 41.8	12 43.8	12 07.0	47	4.0	107	9.0	167	14.1
48	12 42.0	12 44.1	12 07.3	48	4.0	108	9.1	168	14.1
49	12 42.3	12 44.3	12 07.5	49	4.1	109	9.2	169	14.2
50	12 42.5	12 44.6	12 07.8	50	4.2	110	9.3	170	14.3
51	12 42.8	12 44.8	12 08.0	51	4.3	111	9.3	171	14.4
52	12 43.0	12 45.1	12 08.2	52	4.4	112	9.4	172	14.5
53	12 43.3	12 45.3	12 08.5	53	4.5	113	9.5	173	14.6
54	12 43.5	12 45.6	12 08.7	54	4.5	114	9.6	174	14.6
55	12 43.8	12 45.8	12 09.0	55	4.6	115	9.7	175	14.7
56	12 44.0	12 46.1	12 09.2	56	4.7	116	9.8	176	14.8
57	12 44.3	12 46.3	12 09.4	57	4.8	117	9.8	177	14.9
58	12 44.5	12 46.6	12 09.7	58	4.9	118	9.9	178	15.0
59	12 44.8	12 46.8	12 09.9	59	5.0	119	10.0	179	15.1
60	12 45.0	12 47.1	12 10.2	60	5.1	120	10.1	180	15.2

51m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	12 45.0	12 47.1	12 10.2	0	0.0	60	5.2	120	10.3
1	12 45.3	12 47.3	12 10.4	1	0.1	61	5.2	121	10.4
2	12 45.5	12 47.6	12 10.6	2	0.2	62	5.3	122	10.5
3	12 45.8	12 47.8	12 10.9	3	0.3	63	5.4	123	10.6
4	12 46.0	12 48.1	12 11.1	4	0.3	64	5.5	124	10.6
5	12 46.3	12 48.3	12 11.3	5	0.4	65	5.6	125	10.7
6	12 46.5	12 48.6	12 11.6	6	0.5	66	5.7	126	10.8
7	12 46.8	12 48.8	12 11.8	7	0.6	67	5.8	127	10.9
8	12 47.0	12 49.1	12 12.1	8	0.7	68	5.8	128	11.0
9	12 47.3	12 49.4	12 12.3	9	0.8	69	5.9	129	11.1
10	12 47.5	12 49.6	12 12.5	10	0.9	70	6.0	130	11.2
11	12 47.8	12 49.9	12 12.8	11	0.9	71	6.1	131	11.2
12	12 48.0	12 50.1	12 13.0	12	1.0	72	6.2	132	11.3
13	12 48.3	12 50.4	12 13.3	13	1.1	73	6.3	133	11.4
14	12 48.5	12 50.6	12 13.5	14	1.2	74	6.4	134	11.5
15	12 48.8	12 50.9	12 13.7	15	1.3	75	6.4	135	11.6
16	12 49.0	12 51.1	12 14.0	16	1.4	76	6.5	136	11.7
17	12 49.3	12 51.4	12 14.2	17	1.5	77	6.6	137	11.8
18	12 49.5	12 51.6	12 14.4	18	1.5	78	6.7	138	11.8
19	12 49.8	12 51.9	12 14.7	19	1.6	79	6.8	139	11.9
20	12 50.0	12 52.1	12 14.9	20	1.7	80	6.9	140	12.0
21	12 50.3	12 52.4	12 15.2	21	1.8	81	7.0	141	12.1
22	12 50.5	12 52.6	12 15.4	22	1.9	82	7.0	142	12.2
23	12 50.8	12 52.9	12 15.6	23	2.0	83	7.1	143	12.3
24	12 51.0	12 53.1	12 15.9	24	2.1	84	7.2	144	12.4
25	12 51.3	12 53.4	12 16.1	25	2.1	85	7.3	145	12.4
26	12 51.5	12 53.6	12 16.4	26	2.2	86	7.4	146	12.5
27	12 51.8	12 53.9	12 16.6	27	2.3	87	7.5	147	12.6
28	12 52.0	12 54.1	12 16.8	28	2.4	88	7.6	148	12.7
29	12 52.3	12 54.4	12 17.1	29	2.5	89	7.6	149	12.8
30	12 52.5	12 54.6	12 17.3	30	2.6	90	7.7	150	12.9
31	12 52.8	12 54.9	12 17.5	31	2.7	91	7.8	151	13.0
32	12 53.0	12 55.1	12 17.8	32	2.7	92	7.9	152	13.0
33	12 53.3	12 55.4	12 18.0	33	2.8	93	8.0	153	13.1
34	12 53.5	12 55.6	12 18.3	34	2.9	94	8.1	154	13.2
35	12 53.8	12 55.9	12 18.5	35	3.0	95	8.2	155	13.3
36	12 54.0	12 56.1	12 18.7	36	3.1	96	8.2	156	13.4
37	12 54.3	12 56.4	12 19.0	37	3.2	97	8.3	157	13.5
38	12 54.5	12 56.6	12 19.2	38	3.3	98	8.4	158	13.6
39	12 54.8	12 56.9	12 19.5	39	3.3	99	8.5	159	13.6
40	12 55.0	12 57.1	12 19.7	40	3.4	100	8.6	160	13.7
41	12 55.3	12 57.4	12 19.9	41	3.5	101	8.7	161	13.8
42	12 55.5	12 57.6	12 20.2	42	3.6	102	8.8	162	13.9
43	12 55.8	12 57.9	12 20.4	43	3.7	103	8.8	163	14.0
44	12 56.0	12 58.1	12 20.6	44	3.8	104	8.9	164	14.1
45	12 56.3	12 58.4	12 20.9	45	3.9	105	9.0	165	14.2
46	12 56.5	12 58.6	12 21.1	46	3.9	106	9.1	166	14.2
47	12 56.8	12 58.9	12 21.4	47	4.0	107	9.2	167	14.3
48	12 57.0	12 59.1	12 21.6	48	4.1	108	9.3	168	14.4
49	12 57.3	12 59.4	12 21.8	49	4.2	109	9.4	169	14.5
50	12 57.5	12 59.6	12 22.1	50	4.3	110	9.4	170	14.6
51	12 57.8	12 59.9	12 22.3	51	4.4	111	9.5	171	14.7
52	12 58.0	13 00.1	12 22.6	52	4.5	112	9.6	172	14.8
53	12 58.3	13 00.4	12 22.8	53	4.5	113	9.7	173	14.8
54	12 58.5	13 00.6	12 23.0	54	4.6	114	9.8	174	14.9
55	12 58.8	13 00.9	12 23.3	55	4.7	115	9.9	175	15.0
56	12 59.0	13 01.1	12 23.5	56	4.8	116	10.0	176	15.1
57	12 59.3	13 01.4	12 23.8	57	4.9	117	10.0	177	15.2
58	12 59.5	13 01.6	12 24.0	58	5.0	118	10.1	178	15.3
59	12 59.8	13 01.9	12 24.2	59	5.1	119	10.2	179	15.4
60	13 00.0	13 02.1	12 24.5	60	5.2	120	10.3	180	15.5

52m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	13 00.0	13 02.1	12 24.5	0	0.0	60	5.3	120	10.5
1	13 00.3	13 02.4	12 24.7	1	0.1	61	5.3	121	10.6
2	13 00.5	13 02.6	12 24.9	2	0.2	62	5.4	122	10.7
3	13 00.8	13 02.9	12 25.2	3	0.3	63	5.5	123	10.8
4	13 01.0	13 03.1	12 25.4	4	0.4	64	5.6	124	10.9
5	13 01.3	13 03.4	12 25.7	5	0.4	65	5.7	125	10.9
6	13 01.5	13 03.6	12 25.9	6	0.5	66	5.8	126	11.0
7	13 01.8	13 03.9	12 26.1	7	0.6	67	5.9	127	11.1
8	13 02.0	13 04.1	12 26.4	8	0.7	68	6.0	128	11.2
9	13 02.3	13 04.4	12 26.6	9	0.8	69	6.0	129	11.3
10	13 02.5	13 04.6	12 26.9	10	0.9	70	6.1	130	11.4
11	13 02.8	13 04.9	12 27.1	11	1.0	71	6.2	131	11.5
12	13 03.0	13 05.1	12 27.3	12	1.1	72	6.3	132	11.6
13	13 03.3	13 05.4	12 27.6	13	1.1	73	6.4	133	11.6
14	13 03.5	13 05.6	12 27.8	14	1.2	74	6.5	134	11.7
15	13 03.8	13 05.9	12 28.0	15	1.3	75	6.6	135	11.8
16	13 04.0	13 06.1	12 28.3	16	1.4	76	6.7	136	11.9
17	13 04.3	13 06.4	12 28.5	17	1.5	77	6.7	137	12.0
18	13 04.5	13 06.6	12 28.8	18	1.6	78	6.8	138	12.1
19	13 04.8	13 06.9	12 29.0	19	1.7	79	6.9	139	12.2
20	13 05.0	13 07.1	12 29.2	20	1.8	80	7.0	140	12.3
21	13 05.3	13 07.4	12 29.5	21	1.8	81	7.1	141	12.3
22	13 05.5	13 07.7	12 29.7	22	1.9	82	7.2	142	12.4
23	13 05.8	13 07.9	12 30.0	23	2.0	83	7.3	143	12.5
24	13 06.0	13 08.2	12 30.2	24	2.1	84	7.4	144	12.6
25	13 06.3	13 08.4	12 30.4	25	2.2	85	7.4	145	12.7
26	13 06.5	13 08.7	12 30.7	26	2.3	86	7.5	146	12.8
27	13 06.8	13 08.9	12 30.9	27	2.4	87	7.6	147	12.9
28	13 07.0	13 09.2	12 31.1	28	2.5	88	7.7	148	13.0
29	13 07.3	13 09.4	12 31.4	29	2.5	89	7.8	149	13.0
30	13 07.5	13 09.7	12 31.6	30	2.6	90	7.9	150	13.1
31	13 07.8	13 09.9	12 31.9	31	2.7	91	8.0	151	13.2
32	13 08.0	13 10.2	12 32.1	32	2.8	92	8.1	152	13.3
33	13 08.3	13 10.4	12 32.3	33	2.9	93	8.1	153	13.4
34	13 08.5	13 10.7	12 32.6	34	3.0	94	8.2	154	13.5
35	13 08.8	13 10.9	12 32.8	35	3.1	95	8.3	155	13.6
36	13 09.0	13 11.2	12 33.1	36	3.2	96	8.4	156	13.7
37	13 09.3	13 11.4	12 33.3	37	3.2	97	8.5	157	13.7
38	13 09.5	13 11.7	12 33.5	38	3.3	98	8.6	158	13.8
39	13 09.8	13 11.9	12 33.8	39	3.4	99	8.7	159	13.9
40	13 10.0	13 12.2	12 34.0	40	3.5	100	8.8	160	14.0
41	13 10.3	13 12.4	12 34.2	41	3.6	101	8.8	161	14.1
42	13 10.5	13 12.7	12 34.5	42	3.7	102	8.9	162	14.2
43	13 10.8	13 12.9	12 34.7	43	3.8	103	9.0	163	14.3
44	13 11.0	13 13.2	12 35.0	44	3.9	104	9.1	164	14.4
45	13 11.3	13 13.4	12 35.2	45	3.9	105	9.2	165	14.4
46	13 11.5	13 13.7	12 35.4	46	4.0	106	9.3	166	14.5
47	13 11.8	13 13.9	12 35.7	47	4.1	107	9.4	167	14.6
48	13 12.0	13 14.2	12 35.9	48	4.2	108	9.5	168	14.7
49	13 12.3	13 14.4	12 36.2	49	4.3	109	9.5	169	14.8
50	13 12.5	13 14.7	12 36.4	50	4.4	110	9.6	170	14.9
51	13 12.8	13 14.9	12 36.6	51	4.5	111	9.7	171	15.0
52	13 13.0	13 15.2	12 36.9	52	4.6	112	9.8	172	15.1
53	13 13.3	13 15.4	12 37.1	53	4.6	113	9.9	173	15.1
54	13 13.5	13 15.7	12 37.4	54	4.7	114	10.0	174	15.2
55	13 13.8	13 15.9	12 37.6	55	4.8	115	10.1	175	15.3
56	13 14.0	13 16.2	12 37.8	56	4.9	116	10.2	176	15.4
57	13 14.3	13 16.4	12 38.1	57	5.0	117	10.2	177	15.5
58	13 14.5	13 16.7	12 38.3	58	5.1	118	10.3	178	15.6
59	13 14.8	13 16.9	12 38.5	59	5.2	119	10.4	179	15.7
60	13 15.0	13 17.2	12 38.8	60	5.3	120	10.5	180	15.8

53m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	13 15.0	13 17.2	12 38.8	0	0.0	60	5.4	120	10.7
1	13 15.3	13 17.4	12 39.0	1	0.1	61	5.4	121	10.8
2	13 15.5	13 17.7	12 39.3	2	0.2	62	5.5	122	10.9
3	13 15.8	13 17.9	12 39.5	3	0.3	63	5.6	123	11.0
4	13 16.0	13 18.2	12 39.7	4	0.4	64	5.7	124	11.1
5	13 16.3	13 18.4	12 40.0	5	0.4	65	5.8	125	11.1
6	13 16.5	13 18.7	12 40.2	6	0.5	66	5.9	126	11.2
7	13 16.8	13 18.9	12 40.5	7	0.6	67	6.0	127	11.3
8	13 17.0	13 19.2	12 40.7	8	0.7	68	6.1	128	11.4
9	13 17.3	13 19.4	12 40.9	9	0.8	69	6.2	129	11.5
10	13 17.5	13 19.7	12 41.2	10	0.9	70	6.2	130	11.6
11	13 17.8	13 19.9	12 41.4	11	1.0	71	6.3	131	11.7
12	13 18.0	13 20.2	12 41.6	12	1.1	72	6.4	132	11.8
13	13 18.3	13 20.4	12 41.9	13	1.2	73	6.5	133	11.9
14	13 18.5	13 20.7	12 42.1	14	1.2	74	6.6	134	11.9
15	13 18.8	13 20.9	12 42.4	15	1.3	75	6.7	135	12.0
16	13 19.0	13 21.2	12 42.6	16	1.4	76	6.8	136	12.1
17	13 19.3	13 21.4	12 42.8	17	1.5	77	6.9	137	12.2
18	13 19.5	13 21.7	12 43.1	18	1.6	78	7.0	138	12.3
19	13 19.8	13 21.9	12 43.3	19	1.7	79	7.0	139	12.4
20	13 20.0	13 22.2	12 43.6	20	1.8	80	7.1	140	12.5
21	13 20.3	13 22.4	12 43.8	21	1.9	81	7.2	141	12.6
22	13 20.5	13 22.7	12 44.0	22	2.0	82	7.3	142	12.7
23	13 20.8	13 22.9	12 44.3	23	2.1	83	7.4	143	12.8
24	13 21.0	13 23.2	12 44.5	24	2.1	84	7.5	144	12.8
25	13 21.3	13 23.4	12 44.7	25	2.2	85	7.6	145	12.9
26	13 21.5	13 23.7	12 45.0	26	2.3	86	7.7	146	13.0
27	13 21.8	13 23.9	12 45.2	27	2.4	87	7.8	147	13.1
28	13 22.0	13 24.2	12 45.5	28	2.5	88	7.8	148	13.2
29	13 22.3	13 24.4	12 45.7	29	2.6	89	7.9	149	13.3
30	13 22.5	13 24.7	12 45.9	30	2.7	90	8.0	150	13.4
31	13 22.8	13 24.9	12 46.2	31	2.8	91	8.1	151	13.5
32	13 23.0	13 25.2	12 46.4	32	2.9	92	8.2	152	13.6
33	13 23.3	13 25.4	12 46.7	33	2.9	93	8.3	153	13.6
34	13 23.5	13 25.7	12 46.9	34	3.0	94	8.4	154	13.7
35	13 23.8	13 26.0	12 47.1	35	3.1	95	8.5	155	13.8
36	13 24.0	13 26.2	12 47.4	36	3.2	96	8.6	156	13.9
37	13 24.3	13 26.5	12 47.6	37	3.3	97	8.6	157	14.0
38	13 24.5	13 26.7	12 47.9	38	3.4	98	8.7	158	14.1
39	13 24.8	13 27.0	12 48.1	39	3.5	99	8.8	159	14.2
40	13 25.0	13 27.2	12 48.3	40	3.6	100	8.9	160	14.3
41	13 25.3	13 27.5	12 48.6	41	3.7	101	9.0	161	14.4
42	13 25.5	13 27.7	12 48.8	42	3.7	102	9.1	162	14.4
43	13 25.8	13 28.0	12 49.0	43	3.8	103	9.2	163	14.5
44	13 26.0	13 28.2	12 49.3	44	3.9	104	9.3	164	14.6
45	13 26.3	13 28.5	12 49.5	45	4.0	105	9.4	165	14.7
46	13 26.5	13 28.7	12 49.8	46	4.1	106	9.5	166	14.8
47	13 26.8	13 29.0	12 50.0	47	4.2	107	9.5	167	14.9
48	13 27.0	13 29.2	12 50.2	48	4.3	108	9.6	168	15.0
49	13 27.3	13 29.5	12 50.5	49	4.4	109	9.7	169	15.1
50	13 27.5	13 29.7	12 50.7	50	4.5	110	9.8	170	15.2
51	13 27.8	13 30.0	12 51.0	51	4.5	111	9.9	171	15.2
52	13 28.0	13 30.2	12 51.2	52	4.6	112	10.0	172	15.3
53	13 28.3	13 30.5	12 51.4	53	4.7	113	10.1	173	15.4
54	13 28.5	13 30.7	12 51.7	54	4.8	114	10.2	174	15.5
55	13 28.8	13 31.0	12 51.9	55	4.9	115	10.3	175	15.6
56	13 29.0	13 31.2	12 52.1	56	5.0	116	10.3	176	15.7
57	13 29.3	13 31.5	12 52.4	57	5.1	117	10.4	177	15.8
58	13 29.5	13 31.7	12 52.6	58	5.2	118	10.5	178	15.9
59	13 29.8	13 32.0	12 52.9	59	5.3	119	10.6	179	16.0
60	13 30.0	13 32.2	12 53.1	60	5.4	120	10.7	180	16.1

54m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	13 30.0	13 32.2	12 53.1	0	0.0	60	5.5	120	10.9
1	13 30.3	13 32.5	12 53.3	1	0.1	61	5.5	121	11.0
2	13 30.5	13 32.7	12 53.6	2	0.2	62	5.6	122	11.1
3	13 30.8	13 33.0	12 53.8	3	0.3	63	5.7	123	11.2
4	13 31.0	13 33.2	12 54.1	4	0.4	64	5.8	124	11.3
5	13 31.3	13 33.5	12 54.3	5	0.5	65	5.9	125	11.4
6	13 31.5	13 33.7	12 54.5	6	0.5	66	6.0	126	11.4
7	13 31.8	13 34.0	12 54.8	7	0.6	67	6.1	127	11.5
8	13 32.0	13 34.2	12 55.0	8	0.7	68	6.2	128	11.6
9	13 32.3	13 34.5	12 55.2	9	0.8	69	6.3	129	11.7
10	13 32.5	13 34.7	12 55.5	10	0.9	70	6.4	130	11.8
11	13 32.8	13 35.0	12 55.7	11	1.0	71	6.4	131	11.9
12	13 33.0	13 35.2	12 56.0	12	1.1	72	6.5	132	12.0
13	13 33.3	13 35.5	12 56.2	13	1.2	73	6.6	133	12.1
14	13 33.5	13 35.7	12 56.4	14	1.3	74	6.7	134	12.2
15	13 33.8	13 36.0	12 56.7	15	1.4	75	6.8	135	12.3
16	13 34.0	13 36.2	12 56.9	16	1.5	76	6.9	136	12.4
17	13 34.3	13 36.5	12 57.2	17	1.5	77	7.0	137	12.4
18	13 34.5	13 36.7	12 57.4	18	1.6	78	7.1	138	12.5
19	13 34.8	13 37.0	12 57.6	19	1.7	79	7.2	139	12.6
20	13 35.0	13 37.2	12 57.9	20	1.8	80	7.3	140	12.7
21	13 35.3	13 37.5	12 58.1	21	1.9	81	7.4	141	12.8
22	13 35.5	13 37.7	12 58.3	22	2.0	82	7.4	142	12.9
23	13 35.8	13 38.0	12 58.6	23	2.1	83	7.5	143	13.0
24	13 36.0	13 38.2	12 58.8	24	2.2	84	7.6	144	13.1
25	13 36.3	13 38.5	12 59.1	25	2.3	85	7.7	145	13.2
26	13 36.5	13 38.7	12 59.3	26	2.4	86	7.8	146	13.3
27	13 36.8	13 39.0	12 59.5	27	2.5	87	7.9	147	13.4
28	13 37.0	13 39.2	12 59.8	28	2.5	88	8.0	148	13.4
29	13 37.3	13 39.5	13 00.0	29	2.6	89	8.1	149	13.5
30	13 37.5	13 39.7	13 00.3	30	2.7	90	8.2	150	13.6
31	13 37.8	13 40.0	13 00.5	31	2.8	91	8.3	151	13.7
32	13 38.0	13 40.2	13 00.7	32	2.9	92	8.4	152	13.8
33	13 38.3	13 40.5	13 01.0	33	3.0	93	8.4	153	13.9
34	13 38.5	13 40.7	13 01.2	34	3.1	94	8.5	154	14.0
35	13 38.8	13 41.0	13 01.5	35	3.2	95	8.6	155	14.1
36	13 39.0	13 41.2	13 01.7	36	3.3	96	8.7	156	14.2
37	13 39.3	13 41.5	13 01.9	37	3.4	97	8.8	157	14.3
38	13 39.5	13 41.7	13 02.2	38	3.5	98	8.9	158	14.4
39	13 39.8	13 42.0	13 02.4	39	3.5	99	9.0	159	14.4
40	13 40.0	13 42.2	13 02.6	40	3.6	100	9.1	160	14.5
41	13 40.3	13 42.5	13 02.9	41	3.7	101	9.2	161	14.6
42	13 40.5	13 42.7	13 03.1	42	3.8	102	9.3	162	14.7
43	13 40.8	13 43.0	13 03.4	43	3.9	103	9.4	163	14.8
44	13 41.0	13 43.2	13 03.6	44	4.0	104	9.4	164	14.9
45	13 41.3	13 43.5	13 03.8	45	4.1	105	9.5	165	15.0
46	13 41.5	13 43.7	13 04.1	46	4.2	106	9.6	166	15.1
47	13 41.8	13 44.0	13 04.3	47	4.3	107	9.7	167	15.2
48	13 42.0	13 44.3	13 04.6	48	4.4	108	9.8	168	15.3
49	13 42.3	13 44.5	13 04.8	49	4.5	109	9.9	169	15.4
50	13 42.5	13 44.8	13 05.0	50	4.5	110	10.0	170	15.4
51	13 42.8	13 45.0	13 05.3	51	4.6	111	10.1	171	15.5
52	13 43.0	13 45.3	13 05.5	52	4.7	112	10.2	172	15.6
53	13 43.3	13 45.5	13 05.7	53	4.8	113	10.3	173	15.7
54	13 43.5	13 45.8	13 06.0	54	4.9	114	10.4	174	15.8
55	13 43.8	13 46.0	13 06.2	55	5.0	115	10.4	175	15.9
56	13 44.0	13 46.3	13 06.5	56	5.1	116	10.5	176	16.0
57	13 44.3	13 46.5	13 06.7	57	5.2	117	10.6	177	16.1
58	13 44.5	13 46.8	13 06.9	58	5.3	118	10.7	178	16.2
59	13 44.8	13 47.0	13 07.2	59	5.4	119	10.8	179	16.3
60	13 45.0	13 47.3	13 07.4	60	5.5	120	10.9	180	16.4

55m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	13 45.0	13 47.3	13 07.4	0	0.0	60	5.6	120	11.1
1	13 45.3	13 47.5	13 07.7	1	0.1	61	5.6	121	11.2
2	13 45.5	13 47.8	13 07.9	2	0.2	62	5.7	122	11.3
3	13 45.8	13 48.0	13 08.1	3	0.3	63	5.8	123	11.4
4	13 46.0	13 48.3	13 08.4	4	0.4	64	5.9	124	11.5
5	13 46.3	13 48.5	13 08.6	5	0.5	65	6.0	125	11.6
6	13 46.5	13 48.8	13 08.8	6	0.6	66	6.1	126	11.7
7	13 46.8	13 49.0	13 09.1	7	0.6	67	6.2	127	11.7
8	13 47.0	13 49.3	13 09.3	8	0.7	68	6.3	128	11.8
9	13 47.3	13 49.5	13 09.6	9	0.8	69	6.4	129	11.9
10	13 47.5	13 49.8	13 09.8	10	0.9	70	6.5	130	12.0
11	13 47.8	13 50.0	13 10.0	11	1.0	71	6.6	131	12.1
12	13 48.0	13 50.3	13 10.3	12	1.1	72	6.7	132	12.2
13	13 48.3	13 50.5	13 10.5	13	1.2	73	6.8	133	12.3
14	13 48.5	13 50.8	13 10.8	14	1.3	74	6.8	134	12.4
15	13 48.8	13 51.0	13 11.0	15	1.4	75	6.9	135	12.5
16	13 49.0	13 51.3	13 11.2	16	1.5	76	7.0	136	12.6
17	13 49.3	13 51.5	13 11.5	17	1.6	77	7.1	137	12.7
18	13 49.5	13 51.8	13 11.7	18	1.7	78	7.2	138	12.8
19	13 49.8	13 52.0	13 12.0	19	1.8	79	7.3	139	12.9
20	13 50.0	13 52.3	13 12.2	20	1.9	80	7.4	140	13.0
21	13 50.3	13 52.5	13 12.4	21	1.9	81	7.5	141	13.0
22	13 50.5	13 52.8	13 12.7	22	2.0	82	7.6	142	13.1
23	13 50.8	13 53.0	13 12.9	23	2.1	83	7.7	143	13.2
24	13 51.0	13 53.3	13 13.1	24	2.2	84	7.8	144	13.3
25	13 51.3	13 53.5	13 13.4	25	2.3	85	7.9	145	13.4
26	13 51.5	13 53.8	13 13.6	26	2.4	86	8.0	146	13.5
27	13 51.8	13 54.0	13 13.9	27	2.5	87	8.0	147	13.6
28	13 52.0	13 54.3	13 14.1	28	2.6	88	8.1	148	13.7
29	13 52.3	13 54.5	13 14.3	29	2.7	89	8.2	149	13.8
30	13 52.5	13 54.8	13 14.6	30	2.8	90	8.3	150	13.9
31	13 52.8	13 55.0	13 14.8	31	2.9	91	8.4	151	14.0
32	13 53.0	13 55.3	13 15.1	32	3.0	92	8.5	152	14.1
33	13 53.3	13 55.5	13 15.3	33	3.1	93	8.6	153	14.2
34	13 53.5	13 55.8	13 15.5	34	3.1	94	8.7	154	14.2
35	13 53.8	13 56.0	13 15.8	35	3.2	95	8.8	155	14.3
36	13 54.0	13 56.3	13 16.0	36	3.3	96	8.9	156	14.4
37	13 54.3	13 56.5	13 16.2	37	3.4	97	9.0	157	14.5
38	13 54.5	13 56.8	13 16.5	38	3.5	98	9.1	158	14.6
39	13 54.8	13 57.0	13 16.7	39	3.6	99	9.2	159	14.7
40	13 55.0	13 57.3	13 17.0	40	3.7	100	9.3	160	14.8
41	13 55.3	13 57.5	13 17.2	41	3.8	101	9.3	161	14.9
42	13 55.5	13 57.8	13 17.4	42	3.9	102	9.4	162	15.0
43	13 55.8	13 58.0	13 17.7	43	4.0	103	9.5	163	15.1
44	13 56.0	13 58.3	13 17.9	44	4.1	104	9.6	164	15.2
45	13 56.3	13 58.5	13 18.2	45	4.2	105	9.7	165	15.3
46	13 56.5	13 58.8	13 18.4	46	4.3	106	9.8	166	15.4
47	13 56.8	13 59.0	13 18.6	47	4.3	107	9.9	167	15.4
48	13 57.0	13 59.3	13 18.9	48	4.4	108	10.0	168	15.5
49	13 57.3	13 59.5	13 19.1	49	4.5	109	10.1	169	15.6
50	13 57.5	13 59.8	13 19.3	50	4.6	110	10.2	170	15.7
51	13 57.8	14 00.0	13 19.6	51	4.7	111	10.3	171	15.8
52	13 58.0	14 00.3	13 19.8	52	4.8	112	10.4	172	15.9
53	13 58.3	14 00.5	13 20.1	53	4.9	113	10.5	173	16.0
54	13 58.5	14 00.8	13 20.3	54	5.0	114	10.5	174	16.1
55	13 58.8	14 01.0	13 20.5	55	5.1	115	10.6	175	16.2
56	13 59.0	14 01.3	13 20.8	56	5.2	116	10.7	176	16.3
57	13 59.3	14 01.5	13 21.0	57	5.3	117	10.8	177	16.4
58	13 59.5	14 01.8	13 21.3	58	5.4	118	10.9	178	16.5
59	13 59.8	14 02.0	13 21.5	59	5.5	119	11.0	179	16.6
60	14 00.0	14 02.3	13 21.7	60	5.6	120	11.1	180	16.7

56m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	14 00.0	14 02.3	13 21.7	0	0.0	60	5.7	120	11.3
1	14 00.3	14 02.6	13 22.0	1	0.1	61	5.7	121	11.4
2	14 00.5	14 02.8	13 22.2	2	0.2	62	5.8	122	11.5
3	14 00.8	14 03.1	13 22.4	3	0.3	63	5.9	123	11.6
4	14 01.0	14 03.3	13 22.7	4	0.4	64	6.0	124	11.7
5	14 01.3	14 03.6	13 22.9	5	0.5	65	6.1	125	11.8
6	14 01.5	14 03.8	13 23.2	6	0.6	66	6.2	126	11.9
7	14 01.8	14 04.1	13 23.4	7	0.7	67	6.3	127	12.0
8	14 02.0	14 04.3	13 23.6	8	0.8	68	6.4	128	12.1
9	14 02.3	14 04.6	13 23.9	9	0.8	69	6.5	129	12.1
10	14 02.5	14 04.8	13 24.1	10	0.9	70	6.6	130	12.2
11	14 02.8	14 05.1	13 24.4	11	1.0	71	6.7	131	12.3
12	14 03.0	14 05.3	13 24.6	12	1.1	72	6.8	132	12.4
13	14 03.3	14 05.6	13 24.8	13	1.2	73	6.9	133	12.5
14	14 03.5	14 05.8	13 25.1	14	1.3	74	7.0	134	12.6
15	14 03.8	14 06.1	13 25.3	15	1.4	75	7.1	135	12.7
16	14 04.0	14 06.3	13 25.6	16	1.5	76	7.2	136	12.8
17	14 04.3	14 06.6	13 25.8	17	1.6	77	7.3	137	12.9
18	14 04.5	14 06.8	13 26.0	18	1.7	78	7.3	138	13.0
19	14 04.8	14 07.1	13 26.3	19	1.8	79	7.4	139	13.1
20	14 05.0	14 07.3	13 26.5	20	1.9	80	7.5	140	13.2
21	14 05.3	14 07.6	13 26.7	21	2.0	81	7.6	141	13.3
22	14 05.5	14 07.8	13 27.0	22	2.1	82	7.7	142	13.4
23	14 05.8	14 08.1	13 27.2	23	2.2	83	7.8	143	13.5
24	14 06.0	14 08.3	13 27.5	24	2.3	84	7.9	144	13.6
25	14 06.3	14 08.6	13 27.7	25	2.4	85	8.0	145	13.7
26	14 06.5	14 08.8	13 27.9	26	2.4	86	8.1	146	13.7
27	14 06.8	14 09.1	13 28.2	27	2.5	87	8.2	147	13.8
28	14 07.0	14 09.3	13 28.4	28	2.6	88	8.3	148	13.9
29	14 07.3	14 09.6	13 28.7	29	2.7	89	8.4	149	14.0
30	14 07.5	14 09.8	13 28.9	30	2.8	90	8.5	150	14.1
31	14 07.8	14 10.1	13 29.1	31	2.9	91	8.6	151	14.2
32	14 08.0	14 10.3	13 29.4	32	3.0	92	8.7	152	14.3
33	14 08.3	14 10.6	13 29.6	33	3.1	93	8.8	153	14.4
34	14 08.5	14 10.8	13 29.8	34	3.2	94	8.9	154	14.5
35	14 08.8	14 11.1	13 30.1	35	3.3	95	8.9	155	14.6
36	14 09.0	14 11.3	13 30.3	36	3.4	96	9.0	156	14.7
37	14 09.3	14 11.6	13 30.6	37	3.5	97	9.1	157	14.8
38	14 09.5	14 11.8	13 30.8	38	3.6	98	9.2	158	14.9
39	14 09.8	14 12.1	13 31.0	39	3.7	99	9.3	159	15.0
40	14 10.0	14 12.3	13 31.3	40	3.8	100	9.4	160	15.1
41	14 10.3	14 12.6	13 31.5	41	3.9	101	9.5	161	15.2
42	14 10.5	14 12.8	13 31.8	42	4.0	102	9.6	162	15.3
43	14 10.8	14 13.1	13 32.0	43	4.0	103	9.7	163	15.3
44	14 11.0	14 13.3	13 32.2	44	4.1	104	9.8	164	15.4
45	14 11.3	14 13.6	13 32.5	45	4.2	105	9.9	165	15.5
46	14 11.5	14 13.8	13 32.7	46	4.3	106	10.0	166	15.6
47	14 11.8	14 14.1	13 32.9	47	4.4	107	10.1	167	15.7
48	14 12.0	14 14.3	13 33.2	48	4.5	108	10.2	168	15.8
49	14 12.3	14 14.6	13 33.4	49	4.6	109	10.3	169	15.9
50	14 12.5	14 14.8	13 33.7	50	4.7	110	10.4	170	16.0
51	14 12.8	14 15.1	13 33.9	51	4.8	111	10.5	171	16.1
52	14 13.0	14 15.3	13 34.1	52	4.9	112	10.5	172	16.2
53	14 13.3	14 15.6	13 34.4	53	5.0	113	10.6	173	16.3
54	14 13.5	14 15.8	13 34.6	54	5.1	114	10.7	174	16.4
55	14 13.8	14 16.1	13 34.9	55	5.2	115	10.8	175	16.5
56	14 14.0	14 16.3	13 35.1	56	5.3	116	10.9	176	16.6
57	14 14.3	14 16.6	13 35.3	57	5.4	117	11.0	177	16.7
58	14 14.5	14 16.8	13 35.6	58	5.5	118	11.1	178	16.8
59	14 14.8	14 17.1	13 35.8	59	5.6	119	11.2	179	16.9
60	14 15.0	14 17.3	13 36.1	60	5.7	120	11.3	180	17.0

57m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	14 15.0	14 17.3	13 36.1	0	0.0	60	5.8	120	11.5
1	14 15.3	14 17.6	13 36.3	1	0.1	61	5.8	121	11.6
2	14 15.5	14 17.8	13 36.5	2	0.2	62	5.9	122	11.7
3	14 15.8	14 18.1	13 36.8	3	0.3	63	6.0	123	11.8
4	14 16.0	14 18.3	13 37.0	4	0.4	64	6.1	124	11.9
5	14 16.3	14 18.6	13 37.2	5	0.5	65	6.2	125	12.0
6	14 16.5	14 18.8	13 37.5	6	0.6	66	6.3	126	12.1
7	14 16.8	14 19.1	13 37.7	7	0.7	67	6.4	127	12.2
8	14 17.0	14 19.3	13 38.0	8	0.8	68	6.5	128	12.3
9	14 17.3	14 19.6	13 38.2	9	0.9	69	6.6	129	12.4
10	14 17.5	14 19.8	13 38.4	10	1.0	70	6.7	130	12.5
11	14 17.8	14 20.1	13 38.7	11	1.1	71	6.8	131	12.6
12	14 18.0	14 20.3	13 38.9	12	1.2	72	6.9	132	12.7
13	14 18.3	14 20.6	13 39.2	13	1.2	73	7.0	133	12.7
14	14 18.5	14 20.9	13 39.4	14	1.3	74	7.1	134	12.8
15	14 18.8	14 21.1	13 39.6	15	1.4	75	7.2	135	12.9
16	14 19.0	14 21.4	13 39.9	16	1.5	76	7.3	136	13.0
17	14 19.3	14 21.6	13 40.1	17	1.6	77	7.4	137	13.1
18	14 19.5	14 21.9	13 40.3	18	1.7	78	7.5	138	13.2
19	14 19.8	14 22.1	13 40.6	19	1.8	79	7.6	139	13.3
20	14 20.0	14 22.4	13 40.8	20	1.9	80	7.7	140	13.4
21	14 20.3	14 22.6	13 41.1	21	2.0	81	7.8	141	13.5
22	14 20.5	14 22.9	13 41.3	22	2.1	82	7.9	142	13.6
23	14 20.8	14 23.1	13 41.5	23	2.2	83	8.0	143	13.7
24	14 21.0	14 23.4	13 41.8	24	2.3	84	8.1	144	13.8
25	14 21.3	14 23.6	13 42.0	25	2.4	85	8.1	145	13.9
26	14 21.5	14 23.9	13 42.3	26	2.5	86	8.2	146	14.0
27	14 21.8	14 24.1	13 42.5	27	2.6	87	8.3	147	14.1
28	14 22.0	14 24.4	13 42.7	28	2.7	88	8.4	148	14.2
29	14 22.3	14 24.6	13 43.0	29	2.8	89	8.5	149	14.3
30	14 22.5	14 24.9	13 43.2	30	2.9	90	8.6	150	14.4
31	14 22.8	14 25.1	13 43.4	31	3.0	91	8.7	151	14.5
32	14 23.0	14 25.4	13 43.7	32	3.1	92	8.8	152	14.6
33	14 23.3	14 25.6	13 43.9	33	3.2	93	8.9	153	14.7
34	14 23.5	14 25.9	13 44.2	34	3.3	94	9.0	154	14.8
35	14 23.8	14 26.1	13 44.4	35	3.4	95	9.1	155	14.9
36	14 24.0	14 26.4	13 44.6	36	3.5	96	9.2	156	15.0
37	14 24.3	14 26.6	13 44.9	37	3.5	97	9.3	157	15.0
38	14 24.5	14 26.9	13 45.1	38	3.6	98	9.4	158	15.1
39	14 24.8	14 27.1	13 45.4	39	3.7	99	9.5	159	15.2
40	14 25.0	14 27.4	13 45.6	40	3.8	100	9.6	160	15.3
41	14 25.3	14 27.6	13 45.8	41	3.9	101	9.7	161	15.4
42	14 25.5	14 27.9	13 46.1	42	4.0	102	9.8	162	15.5
43	14 25.8	14 28.1	13 46.3	43	4.1	103	9.9	163	15.6
44	14 26.0	14 28.4	13 46.5	44	4.2	104	10.0	164	15.7
45	14 26.3	14 28.6	13 46.8	45	4.3	105	10.1	165	15.8
46	14 26.5	14 28.9	13 47.0	46	4.4	106	10.2	166	15.9
47	14 26.8	14 29.1	13 47.3	47	4.5	107	10.3	167	16.0
48	14 27.0	14 29.4	13 47.5	48	4.6	108	10.4	168	16.1
49	14 27.3	14 29.6	13 47.7	49	4.7	109	10.4	169	16.2
50	14 27.5	14 29.9	13 48.0	50	4.8	110	10.5	170	16.3
51	14 27.8	14 30.1	13 48.2	51	4.9	111	10.6	171	16.4
52	14 28.0	14 30.4	13 48.5	52	5.0	112	10.7	172	16.5
53	14 28.3	14 30.6	13 48.7	53	5.1	113	10.8	173	16.6
54	14 28.5	14 30.9	13 48.9	54	5.2	114	10.9	174	16.7
55	14 28.8	14 31.1	13 49.2	55	5.3	115	11.0	175	16.8
56	14 29.0	14 31.4	13 49.4	56	5.4	116	11.1	176	16.9
57	14 29.3	14 31.6	13 49.7	57	5.5	117	11.2	177	17.0
58	14 29.5	14 31.9	13 49.9	58	5.6	118	11.3	178	17.1
59	14 29.8	14 32.1	13 50.1	59	5.7	119	11.4	179	17.2
60	14 30.0	14 32.4	13 50.4	60	5.8	120	11.5	180	17.3

58m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	14 30.0	14 32.4	13 50.4	0	0.0	60	5.9	120	11.7
1	14 30.3	14 32.6	13 50.6	1	0.1	61	5.9	121	11.8
2	14 30.5	14 32.9	13 50.8	2	0.2	62	6.0	122	11.9
3	14 30.8	14 33.1	13 51.1	3	0.3	63	6.1	123	12.0
4	14 31.0	14 33.4	13 51.3	4	0.4	64	6.2	124	12.1
5	14 31.3	14 33.6	13 51.6	5	0.5	65	6.3	125	12.2
6	14 31.5	14 33.9	13 51.8	6	0.6	66	6.4	126	12.3
7	14 31.8	14 34.1	13 52.0	7	0.7	67	6.5	127	12.4
8	14 32.0	14 34.4	13 52.3	8	0.8	68	6.6	128	12.5
9	14 32.3	14 34.6	13 52.5	9	0.9	69	6.7	129	12.6
10	14 32.5	14 34.9	13 52.8	10	1.0	70	6.8	130	12.7
11	14 32.8	14 35.1	13 53.0	11	1.1	71	6.9	131	12.8
12	14 33.0	14 35.4	13 53.2	12	1.2	72	7.0	132	12.9
13	14 33.3	14 35.6	13 53.5	13	1.3	73	7.1	133	13.0
14	14 33.5	14 35.9	13 53.7	14	1.4	74	7.2	134	13.1
15	14 33.8	14 36.1	13 53.9	15	1.5	75	7.3	135	13.2
16	14 34.0	14 36.4	13 54.2	16	1.6	76	7.4	136	13.3
17	14 34.3	14 36.6	13 54.4	17	1.7	77	7.5	137	13.4
18	14 34.5	14 36.9	13 54.7	18	1.8	78	7.6	138	13.5
19	14 34.8	14 37.1	13 54.9	19	1.9	79	7.7	139	13.6
20	14 35.0	14 37.4	13 55.1	20	2.0	80	7.8	140	13.7
21	14 35.3	14 37.6	13 55.4	21	2.0	81	7.9	141	13.7
22	14 35.5	14 37.9	13 55.6	22	2.1	82	8.0	142	13.8
23	14 35.8	14 38.1	13 55.9	23	2.2	83	8.1	143	13.9
24	14 36.0	14 38.4	13 56.1	24	2.3	84	8.2	144	14.0
25	14 36.3	14 38.6	13 56.3	25	2.4	85	8.3	145	14.1
26	14 36.5	14 38.9	13 56.6	26	2.5	86	8.4	146	14.2
27	14 36.8	14 39.2	13 56.8	27	2.6	87	8.5	147	14.3
28	14 37.0	14 39.4	13 57.0	28	2.7	88	8.6	148	14.4
29	14 37.3	14 39.7	13 57.3	29	2.8	89	8.7	149	14.5
30	14 37.5	14 39.9	13 57.5	30	2.9	90	8.8	150	14.6
31	14 37.8	14 40.2	13 57.8	31	3.0	91	8.9	151	14.7
32	14 38.0	14 40.4	13 58.0	32	3.1	92	9.0	152	14.8
33	14 38.3	14 40.7	13 58.2	33	3.2	93	9.1	153	14.9
34	14 38.5	14 40.9	13 58.5	34	3.3	94	9.2	154	15.0
35	14 38.8	14 41.2	13 58.7	35	3.4	95	9.3	155	15.1
36	14 39.0	14 41.4	13 59.0	36	3.5	96	9.4	156	15.2
37	14 39.3	14 41.7	13 59.2	37	3.6	97	9.5	157	15.3
38	14 39.5	14 41.9	13 59.4	38	3.7	98	9.6	158	15.4
39	14 39.8	14 42.2	13 59.7	39	3.8	99	9.7	159	15.5
40	14 40.0	14 42.4	13 59.9	40	3.9	100	9.8	160	15.6
41	14 40.3	14 42.7	14 00.1	41	4.0	101	9.8	161	15.7
42	14 40.5	14 42.9	14 00.4	42	4.1	102	9.9	162	15.8
43	14 40.8	14 43.2	14 00.6	43	4.2	103	10.0	163	15.9
44	14 41.0	14 43.4	14 00.9	44	4.3	104	10.1	164	16.0
45	14 41.3	14 43.7	14 01.1	45	4.4	105	10.2	165	16.1
46	14 41.5	14 43.9	14 01.3	46	4.5	106	10.3	166	16.2
47	14 41.8	14 44.2	14 01.6	47	4.6	107	10.4	167	16.3
48	14 42.0	14 44.4	14 01.8	48	4.7	108	10.5	168	16.4
49	14 42.3	14 44.7	14 02.1	49	4.8	109	10.6	169	16.5
50	14 42.5	14 44.9	14 02.3	50	4.9	110	10.7	170	16.6
51	14 42.8	14 45.2	14 02.5	51	5.0	111	10.8	171	16.7
52	14 43.0	14 45.4	14 02.8	52	5.1	112	10.9	172	16.8
53	14 43.3	14 45.7	14 03.0	53	5.2	113	11.0	173	16.9
54	14 43.5	14 45.9	14 03.3	54	5.3	114	11.1	174	17.0
55	14 43.8	14 46.2	14 03.5	55	5.4	115	11.2	175	17.1
56	14 44.0	14 46.4	14 03.7	56	5.5	116	11.3	176	17.2
57	14 44.3	14 46.7	14 04.0	57	5.6	117	11.4	177	17.3
58	14 44.5	14 46.9	14 04.2	58	5.7	118	11.5	178	17.4
59	14 44.8	14 47.2	14 04.4	59	5.8	119	11.6	179	17.5
60	14 45.0	14 47.4	14 04.7	60	5.9	120	11.7	180	17.6

59m

Sec.	SUN PLANET	♈	MOON	code	corr'n	code	corr'n	code	corr'n
	° ′	° ′	° ′		′		′		′
0	14 45.0	14 47.4	14 04.7	0	0.0	60	6.0	120	11.9
1	14 45.3	14 47.7	14 04.9	1	0.1	61	6.0	121	12.0
2	14 45.5	14 47.9	14 05.2	2	0.2	62	6.1	122	12.1
3	14 45.8	14 48.2	14 05.4	3	0.3	63	6.2	123	12.2
4	14 46.0	14 48.4	14 05.6	4	0.4	64	6.3	124	12.3
5	14 46.3	14 48.7	14 05.9	5	0.5	65	6.4	125	12.4
6	14 46.5	14 48.9	14 06.1	6	0.6	66	6.5	126	12.5
7	14 46.8	14 49.2	14 06.4	7	0.7	67	6.6	127	12.6
8	14 47.0	14 49.4	14 06.6	8	0.8	68	6.7	128	12.7
9	14 47.3	14 49.7	14 06.8	9	0.9	69	6.8	129	12.8
10	14 47.5	14 49.9	14 07.1	10	1.0	70	6.9	130	12.9
11	14 47.8	14 50.2	14 07.3	11	1.1	71	7.0	131	13.0
12	14 48.0	14 50.4	14 07.5	12	1.2	72	7.1	132	13.1
13	14 48.3	14 50.7	14 07.8	13	1.3	73	7.2	133	13.2
14	14 48.5	14 50.9	14 08.0	14	1.4	74	7.3	134	13.3
15	14 48.8	14 51.2	14 08.3	15	1.5	75	7.4	135	13.4
16	14 49.0	14 51.4	14 08.5	16	1.6	76	7.5	136	13.5
17	14 49.3	14 51.7	14 08.7	17	1.7	77	7.6	137	13.6
18	14 49.5	14 51.9	14 09.0	18	1.8	78	7.7	138	13.7
19	14 49.8	14 52.2	14 09.2	19	1.9	79	7.8	139	13.8
20	14 50.0	14 52.4	14 09.5	20	2.0	80	7.9	140	13.9
21	14 50.3	14 52.7	14 09.7	21	2.1	81	8.0	141	14.0
22	14 50.5	14 52.9	14 09.9	22	2.2	82	8.1	142	14.1
23	14 50.8	14 53.2	14 10.2	23	2.3	83	8.2	143	14.2
24	14 51.0	14 53.4	14 10.4	24	2.4	84	8.3	144	14.3
25	14 51.3	14 53.7	14 10.6	25	2.5	85	8.4	145	14.4
26	14 51.5	14 53.9	14 10.9	26	2.6	86	8.5	146	14.5
27	14 51.8	14 54.2	14 11.1	27	2.7	87	8.6	147	14.6
28	14 52.0	14 54.4	14 11.4	28	2.8	88	8.7	148	14.7
29	14 52.3	14 54.7	14 11.6	29	2.9	89	8.8	149	14.8
30	14 52.5	14 54.9	14 11.8	30	3.0	90	8.9	150	14.9
31	14 52.8	14 55.2	14 12.1	31	3.1	91	9.0	151	15.0
32	14 53.0	14 55.4	14 12.3	32	3.2	92	9.1	152	15.1
33	14 53.3	14 55.7	14 12.6	33	3.3	93	9.2	153	15.2
34	14 53.5	14 55.9	14 12.8	34	3.4	94	9.3	154	15.3
35	14 53.8	14 56.2	14 13.0	35	3.5	95	9.4	155	15.4
36	14 54.0	14 56.4	14 13.3	36	3.6	96	9.5	156	15.5
37	14 54.3	14 56.7	14 13.5	37	3.7	97	9.6	157	15.6
38	14 54.5	14 56.9	14 13.8	38	3.8	98	9.7	158	15.7
39	14 54.8	14 57.2	14 14.0	39	3.9	99	9.8	159	15.8
40	14 55.0	14 57.5	14 14.2	40	4.0	100	9.9	160	15.9
41	14 55.3	14 57.7	14 14.5	41	4.1	101	10.0	161	16.0
42	14 55.5	14 58.0	14 14.7	42	4.2	102	10.1	162	16.1
43	14 55.8	14 58.2	14 14.9	43	4.3	103	10.2	163	16.2
44	14 56.0	14 58.5	14 15.2	44	4.4	104	10.3	164	16.3
45	14 56.3	14 58.7	14 15.4	45	4.5	105	10.4	165	16.4
46	14 56.5	14 59.0	14 15.7	46	4.6	106	10.5	166	16.5
47	14 56.8	14 59.2	14 15.9	47	4.7	107	10.6	167	16.6
48	14 57.0	14 59.5	14 16.1	48	4.8	108	10.7	168	16.7
49	14 57.3	14 59.7	14 16.4	49	4.9	109	10.8	169	16.8
50	14 57.5	15 00.0	14 16.6	50	5.0	110	10.9	170	16.9
51	14 57.8	15 00.2	14 16.9	51	5.1	111	11.0	171	17.0
52	14 58.0	15 00.5	14 17.1	52	5.2	112	11.1	172	17.1
53	14 58.3	15 00.7	14 17.3	53	5.3	113	11.2	173	17.2
54	14 58.5	15 01.0	14 17.6	54	5.4	114	11.3	174	17.3
55	14 58.8	15 01.2	14 17.8	55	5.5	115	11.4	175	17.4
56	14 59.0	15 01.5	14 18.0	56	5.6	116	11.5	176	17.5
57	14 59.3	15 01.7	14 18.3	57	5.7	117	11.6	177	17.6
58	14 59.5	15 02.0	14 18.5	58	5.8	118	11.7	178	17.7
59	14 59.8	15 02.2	14 18.8	59	5.9	119	11.8	179	17.8
60	15 00.0	15 02.5	14 19.0	60	6.0	120	11.9	180	17.9

NAVIGATIONAL STAR CHART

The star chart assists the navigator in identifying stars. The stars of each constellation are connected by dotted lines; the 57 stars given on the daily pages are identified by their names and numbers, the 34 stars used in H. O. 249 having their names and numbers underlined, and the other navigational stars are identified by their Greek letters. The sidereal hour angle and declination of each star can be determined from the map by means of the network of vertical and horizontal lines. The SHA's are measured (0° to 360°) from the vertical line passing through the Vernal Equinox at 0°. The declinations are measured north and south (+90° to −90°) from the celestial equator which is represented by a horizontal line through the center.

The rectangular shape of the chart distorts the relative positions of the stars in the polar regions. For example the north polar region is distorted so that the pointer stars of the big dipper are not in alignment with Polaris. A globe would give a better representation, and an observer from the inside would see the constellations as they appear in the sky. Then the SHA lines would converge at the north and south poles and the equator and ecliptic would be circles.

An observer's local meridian at any given instant may be located on the chart by means of the SHA coordinates. The basic relation GHA*=GHA♈+SHA* may be written:

$$SHA^*=GHA^*-GHA\,\Upsilon$$

For a star on the meridian the GHA* is equal to the west longitude, whence

$$SHA\ (\text{local meridian})=W\ Long.-GHA\,\Upsilon$$

East longitude may be converted into west longitude by subtracting from 360°.

Example: Locate on the chart the local meridian of an observer in longitude 110° W on Jan. 1, at 6^h GMT. From the daily page for Jan. 1, 2, 3, at 6^h, Jan. 1 the GHA♈=190°. The SHA of his meridian will therefore be 110°+360°−190°=280°.

The identification of a star directly overhead, i. e., in the zenith, is easily made since the point overhead is on the local meridian and also has a Dec. equal to the observer's latitude.

Example: Assume that the observer in the above example is in latitude 40° N and that a star in the zenith is to be identified. The SHA of the star is exactly equal to the SHA of the local meridian and was found to be 280°. The star's Dec. is +40° since the observer's latitude is equal to the Dec. of a point in the zenith.

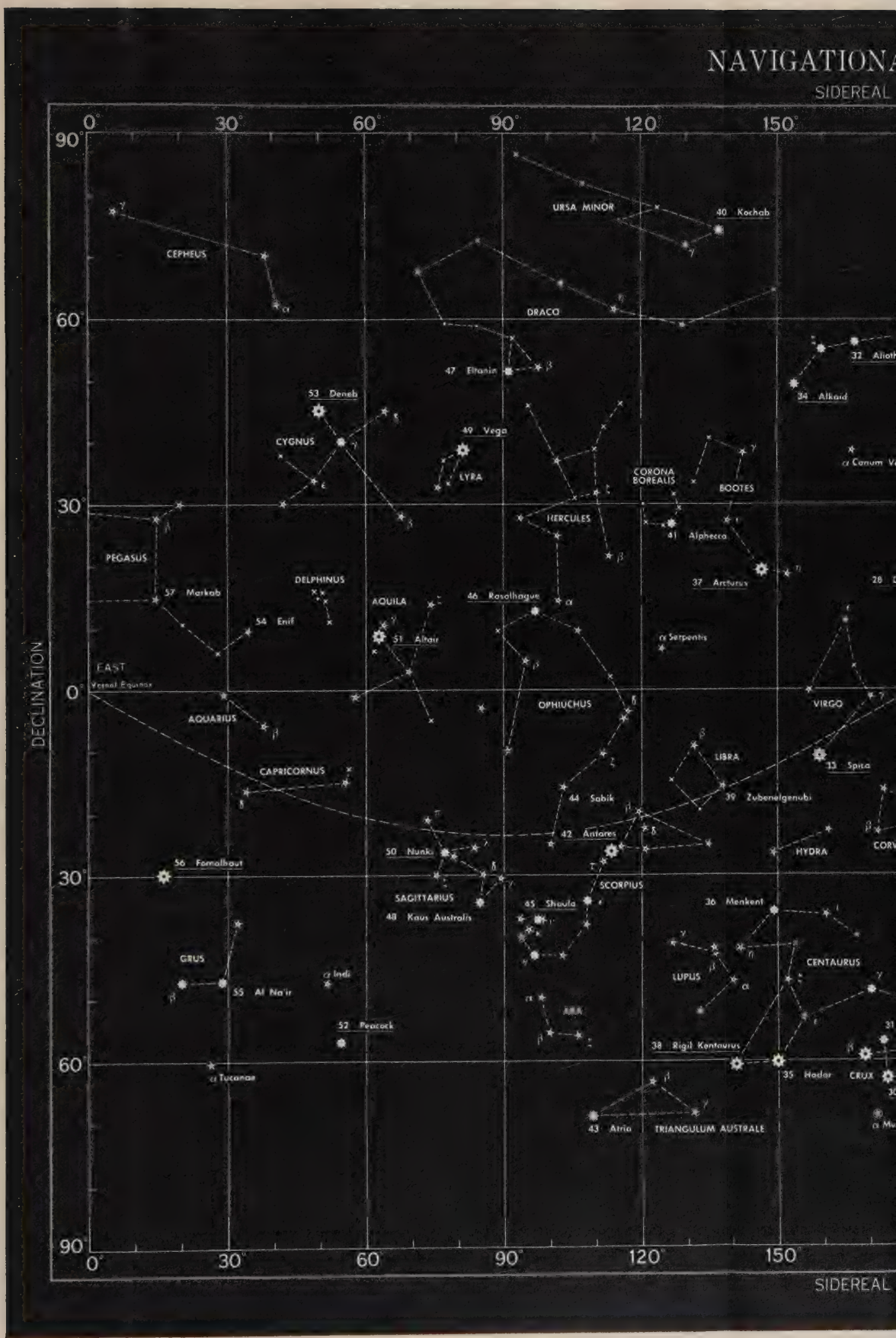
Examination of the chart in the region of SHA=280° and Dec.=+40° shows the brightest star in the region to be the first magnitude star Capella. To verify, this region of the chart may be compared in detail with the sky. One finds the conspicuous triangle formed by the three first magnitude stars Pollux, Aldebaran, and Capella.

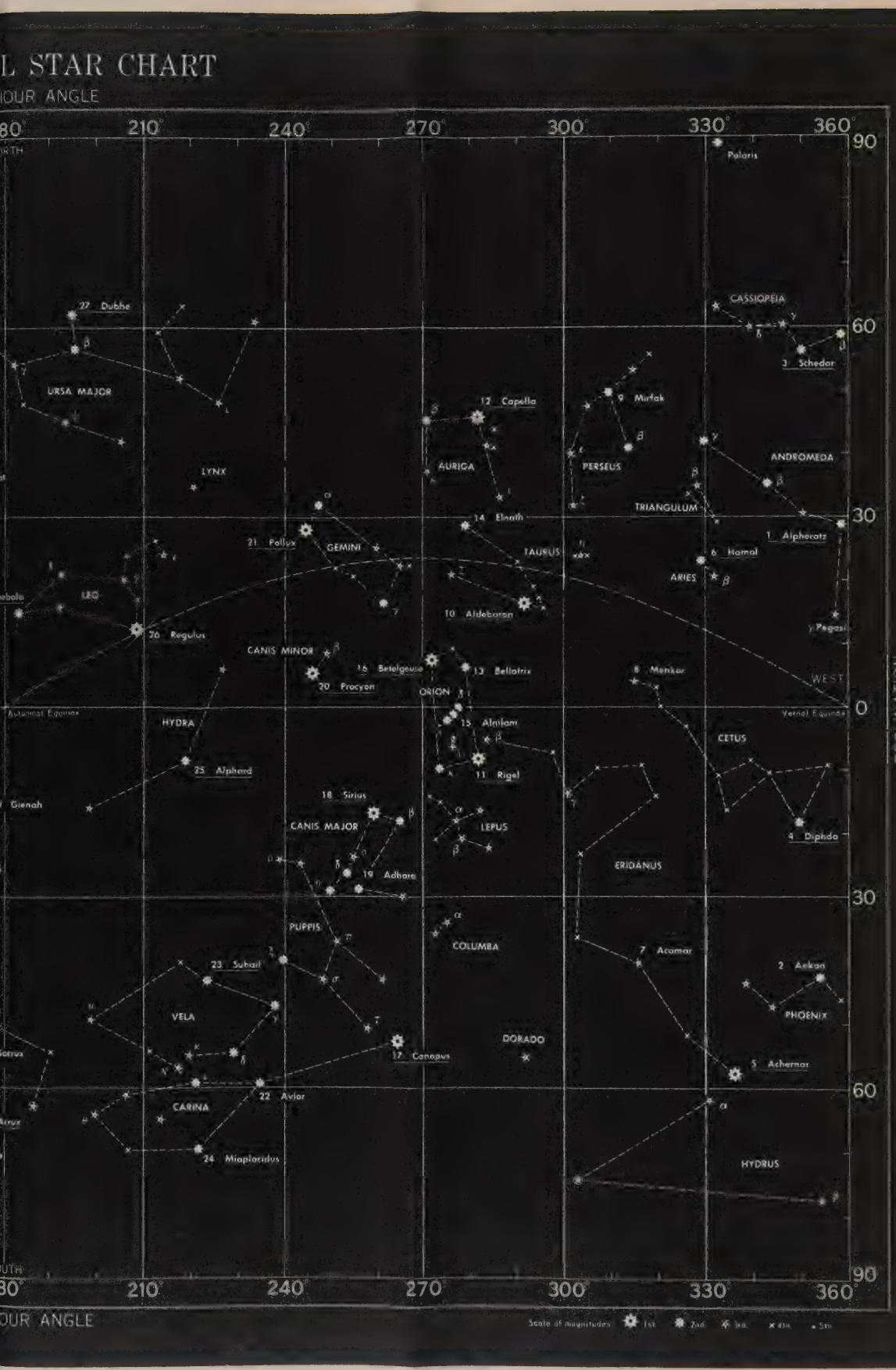
A star to the north or south of the zenith is easily identified because its angular distance from the zenith is equal to the difference between its declination and the observer's latitude. Thus, in the above example, Rigel (Dec.−10°) would appear about 50° south of the zenith or at an altitude of 40°.

The chart may also be used with the "Star Identification Table" in H. O. 214. The table is used to convert an observed altitude and azimuth into Dec. and LHA; the LHA is converted into SHA, and the problem becomes that of the above example, i. e., identification from SHA and Dec. The SHA may be found by adding the LHA, if west, to the SHA of the local meridian and by subtracting it if east.

The ecliptic, which is the path of the Sun among the stars, is represented on the chart by a curved dotted line. The Moon and planets remain always within a few degrees of the ecliptic.

The SHA of a planet can be found by inspection from the daily page. First find the time when the GHA♈=0°, then the GHA of any object at the corresponding time is also the SHA of that object.


NAVIGATIONA
SIDEREAL
0°
30°
60°
90°
120°
150°
90°
60°
30°
0°
30°
60°
90°
DECLINATION
EAST
Vernal Equinox
URSA MINOR
40 Kochab
CEPHEUS
DRACO
47 Eltanin
53 Deneb
CYGNUS
49 Vega
LYRA
CORONA BOREALIS
BOOTES
HERCULES
41 Alphecca
32 Alioth
34 Alkaid
α Canum V
PEGASUS
57 Markab
54 Enif
DELPHINUS
AQUILA
51 Altair
46 Rasalhague
37 Arcturus
α Serpentis
AQUARIUS
OPHIUCHUS
VIRGO
LIBRA
33 Spica
CAPRICORNUS
44 Sabik
39 Zubenelgenubi
42 Antares
HYDRA
56 Fomalhaut
50 Nunki
SCORPIUS
SAGITTARIUS
48 Kaus Australis
45 Shaula
36 Menkent
GRUS
55 Al Na'ir
α Indi
52 Peacock
LUPUS
CENTAURUS
ARA
38 Rigil Kentaurus
35 Hadar
CRUX
α Tucanae
43 Atria
TRIANGULUM AUSTRALE
SIDEREAL


L STAR CHART
IOUR ANGLE
180°
210°
240°
270°
300°
330°
360°
90
60
30
0
30
60
90
DECLINATION
WEST
Autumnal Equinox
Vernal Equinox
Polaris
CASSIOPEIA
3 Schedar
27 Dubhe
URSA MAJOR
LYNX
12 Capella
AURIGA
9 Mirfak
PERSEUS
ANDROMEDA
TRIANGULUM
1 Alpheratz
14 Elnath
21 Pollux
GEMINI
TAURUS
6 Hamal
ARIES
LEO
26 Regulus
10 Aldebaran
Pegasi
CANIS MINOR
16 Betelgeuse
13 Bellatrix
20 Procyon
ORION
8 Menkar
15 Alnilam
HYDRA
11 Rigel
CETUS
25 Alphard
Gienah
18 Sirius
CANIS MAJOR
LEPUS
4 Diphda
19 Adhara
ERIDANUS
PUPPIS
COLUMBA
7 Acamar
23 Suhail
2 Ankaa
VELA
PHOENIX
DORADO
17 Canopus
5 Achernar
CARINA
22 Avior
24 Miaplacidus
HYDRUS
Scale of magnitudes
1st.
2nd.
3rd.
4th.
5th.

JUN 4 1956

CORRECTION TO OBSERVED ALTITUDE OF MOON

ADD

Obs. Alt.	0′	8′	15′	23′	30′	38′	45′	53′	60′	Obs. Alt.	0′	8′	15′	23′	30′	38′	45′	53′	60′
°	′	′	′	′	′	′	′	′	′	°	′	′	′	′	′	′	′	′	′
1	32.6	33.6	34.5	35.3	36.1	36.9	37.6	38.2		46	38.6	38.5	38.5	38.4	38.3	38.2	38.1	38.0	
2	38.8	39.4	40.0	40.5	41.0	41.4	41.9	42.3		47	37.9	37.8	37.8	37.7	37.6	37.5	37.4	37.3	
3	42.7	43.1	43.4	43.8	44.1	44.4	44.7	45.0		48	37.2	37.1	37.1	37.0	36.9	36.8	36.7	36.6	
4	45.2	45.5	45.8	46.0	46.2	46.4	46.6	46.8		49	36.5	36.4	36.3	36.2	36.2	36.1	36.0	35.9	
5	47.0	47.2	47.4	47.6	47.7	47.9	48.0	48.2		50	35.8	35.7	35.6	35.5	35.4	35.3	35.2	35.1	
6	48.3	48.4	48.6	48.7	48.8	48.9	49.0	49.1		51	35.0	35.0	34.9	34.8	34.7	34.6	34.5	34.4	
7	49.2	49.3	49.4	49.5	49.6	49.7	49.8	49.9		52	34.3	34.2	34.1	34.0	33.9	33.8	33.7	33.6	
8	49.9	50.0	50.1	50.2	50.3	50.3	50.4	50.4		53	33.5	33.4	33.3	33.2	33.1	33.0	33.0	32.9	
9	50.5	50.5	50.6	50.6	50.7	50.7	50.8	50.8		54	32.8	32.7	32.6	32.5	32.4	32.3	32.2	32.1	
10	50.9	50.9	50.9	51.0	51.0	51.0	51.1	51.1		55	32.0	31.9	31.8	31.7	31.6	31.5	31.4	31.3	
11	51.1	51.2	51.2	51.2	51.2	51.3	51.3	51.3		56	31.2	31.1	31.0	30.9	30.8	30.7	30.6	30.5	
12	51.3	51.3	51.4	51.4	51.4	51.4	51.4	51.4		57	30.4	30.3	30.2	30.1	30.0	29.9	29.8	29.7	
13	51.4	51.5	51.5	51.5	51.5	51.5	51.5	51.5		58	29.6	29.4	29.3	29.2	29.1	29.0	28.9	28.8	
14	51.5	51.5	51.5	51.5	51.5	51.5	51.5	51.5		59	28.7	28.6	28.5	28.4	28.3	28.2	28.1	28.0	
15	51.5	51.5	51.5	51.5	51.5	51.5	51.5	51.5		60	27.9	27.8	27.7	27.6	27.5	27.4	27.3	27.2	
16	51.5	51.5	51.4	51.4	51.4	51.4	51.4	51.4		61	27.0	26.9	26.8	26.7	26.6	26.5	26.4	26.3	
17	51.4	51.4	51.4	51.3	51.3	51.3	51.3	51.3		62	26.2	26.1	26.0	25.9	25.8	25.7	25.5	25.4	
18	51.3	51.2	51.2	51.2	51.2	51.2	51.1	51.1		63	25.3	25.2	25.1	25.0	24.9	24.8	24.7	24.6	
19	51.1	51.1	51.1	51.0	51.0	51.0	51.0	50.9		64	24.5	24.4	24.2	24.1	24.0	23.9	23.8	23.7	
20	50.9	50.9	50.9	50.8	50.8	50.8	50.8	50.7		65	23.6	23.5	23.4	23.3	23.1	23.0	22.9	22.8	
21	50.7	50.7	50.6	50.6	50.6	50.6	50.5	50.5		66	22.7	22.6	22.5	22.4	22.3	22.1	22.0	21.9	
22	50.5	50.4	50.4	50.4	50.3	50.3	50.3	50.2		67	21.8	21.7	21.6	21.5	21.4	21.2	21.1	21.0	
23	50.2	50.2	50.1	50.1	50.0	50.0	50.0	49.9		68	20.9	20.8	20.7	20.6	20.5	20.3	20.2	20.1	
24	49.9	49.9	49.8	49.8	49.7	49.7	49.7	49.6		69	20.0	19.9	19.8	19.7	19.5	19.4	19.3	19.2	
25	49.6	49.5	49.5	49.5	49.4	49.4	49.3	49.3		70	19.1	19.0	18.9	18.7	18.6	18.5	18.4	18.3	
26	49.2	49.2	49.2	49.1	49.1	49.0	49.0	48.9		71	18.2	18.1	17.9	17.8	17.7	17.6	17.5	17.4	
27	48.9	48.8	48.8	48.7	48.7	48.6	48.6	48.5		72	17.2	17.1	17.0	16.9	16.8	16.7	16.5	16.4	
28	48.5	48.4	48.4	48.3	48.3	48.2	48.2	48.1		73	16.3	16.2	16.1	16.0	15.8	15.7	15.6	15.5	
29	48.1	48.0	48.0	47.9	47.9	47.8	47.8	47.7		74	15.4	15.3	15.1	15.0	14.9	14.8	14.7	14.6	
30	47.7	47.6	47.6	47.5	47.5	47.4	47.3	47.3		75	14.4	14.3	14.2	14.1	14.0	13.8	13.7	13.6	
31	47.2	47.2	47.1	47.1	47.0	46.9	46.9	46.8		76	13.5	13.4	13.3	13.1	13.0	12.9	12.8	12.7	
32	46.8	46.7	46.7	46.6	46.5	46.5	46.4	46.4		77	12.5	12.4	12.3	12.2	12.1	11.9	11.8	11.7	
33	46.3	46.2	46.2	46.1	46.0	46.0	45.9	45.9		78	11.6	11.5	11.3	11.2	11.1	11.0	10.9	10.7	
34	45.8	45.7	45.7	45.6	45.5	45.5	45.4	45.4		79	10.6	10.5	10.4	10.3	10.1	10.0	9.9	9.8	
35	45.3	45.2	45.2	45.1	45.0	45.0	44.9	44.8		80	9.7	9.5	9.4	9.3	9.2	9.1	8.9	8.8	
36	44.8	44.7	44.6	44.6	44.5	44.4	44.3	44.3		81	8.7	8.6	8.5	8.3	8.2	8.1	8.0	7.9	
37	44.2	44.1	44.1	44.0	43.9	43.9	43.8	43.7		82	7.7	7.6	7.5	7.4	7.2	7.1	7.0	6.9	
38	43.7	43.6	43.5	43.4	43.4	43.3	43.2	43.1		83	6.8	6.6	6.5	6.4	6.3	6.2	6.0	5.9	
39	43.1	43.0	42.9	42.9	42.8	42.7	42.6	42.6		84	5.8	5.7	5.5	5.4	5.3	5.2	5.1	4.9	
40	42.5	42.4	42.3	42.3	42.2	42.1	42.0	42.0		85	4.8	4.7	4.6	4.5	4.3	4.2	4.1	4.0	
41	41.9	41.8	41.7	41.6	41.6	41.5	41.4	41.4		86	3.8	3.7	3.6	3.5	3.4	3.2	3.1	3.0	
42	41.3	41.2	41.1	41.0	40.9	40.9	40.8	40.7		87	2.9	2.7	2.6	2.5	2.4	2.3	2.1	2.0	
43	40.6	40.5	40.5	40.4	40.3	40.2	40.1	40.0		88	1.9	1.8	1.6	1.5	1.4	1.3	1.2	1.0	
44	40.0	39.9	39.8	39.7	39.6	39.6	39.5	39.4		89	0.9	0.8	0.7	0.5	0.4	0.3	0.2	0.1	
45	39.3	39.2	39.1	39.0	39.0	38.9	38.8	38.7											

Add to the observed altitude of the Moon's upper limb, lower limb, or center; and apply also the additional correction from the daily page. The degrees of observed altitude are in the column, and the minutes across the top. If the minutes of observed altitude are between 0′.0 and 8′.0, use the first column of corrections; if between 8′.0 and 15′.0, use the second column; etc. If the minutes are exactly 0′.0, 8′.0, 15′.0, etc., use the right-hand column of the two possible.

For height of eye, and corrections for Sun, planets, and stars, see front cover.

STARS

Numerical Order

For Order of SHA Read Up

No.	Name	Mag.	SHA	Dec.
			°	°
1	Alpheratz	2.2	358	+29
2	Ankaa	2.4	354	−43
3	Schedar	2.5	350	+56
4	Diphda	2.2	350	−18
5	Achernar	0.6	336	−57
6	Hamal	2.2	329	+23
7	Acamar	3.1	316	−40
8	Menkar	2.8	315	+ 4
9	Mirfak	1.9	310	+50
10	Aldebaran	1.1	292	+16
11	Rigel	0.3	282	− 8
12	Capella	0.2	282	+46
13	Bellatrix	1.7	279	+ 6
14	Elnath	1.8	279	+29
15	Alnilam	1.8	276	− 1
16	Betelgeuse	0.1 to 1.2	272	+ 7
17	Canopus	−0.9	264	−53
18	Sirius	−1.6	259	−17
19	Adhara	1.6	256	−29
20	Procyon	0.5	246	+ 5
21	Pollux	1.2	244	+28
22	Avior	1.7	235	−59
23	Suhail	2.2	223	−43
24	Miaplacidus	1.8	222	−70
25	Alphard	2.2	219	− 8
26	Regulus	1.3	208	+12
27	Dubhe	2.0	195	+62
28	Denebola	2.2	183	+15
29	Gienah	2.8	177	−17
30	Acrux	1.1	174	−63
31	Gacrux	1.6	173	−57
32	Alioth	1.7	167	+56
33	Spica	1.2	159	−11
34	Alkaid	1.9	154	+50
35	Hadar	0.9	150	−60
36	Menkent	2.3	149	−36
37	Arcturus	0.2	147	+19
38	Rigil Kentaurus	0.1	141	−61
39	Zubenelgenubi	2.9	138	−16
40	Kochab	2.2	137	+74
41	Alphecca	2.3	127	+27
42	Antares	1.2	113	−26
43	Atria	1.9	109	−69
44	Sabik	2.6	103	−16
45	Shaula	1.7	97	−37
46	Rasalhague	2.1	97	+13
47	Eltanin	2.4	91	+51
48	Kaus Australis	2.0	85	−34
49	Vega	0.1	81	+39
50	Nunki	2.1	77	−26
51	Altair	0.9	63	+ 9
52	Peacock	2.1	54	−57
53	Deneb	1.3	50	+45
54	Enif	2.5	34	+10
55	Al Na'ir	2.2	29	−47
56	Fomalhaut	1.3	16	−30
57	Markab	2.6	14	+15

Alphabetical Order

No.	Name	Mag.	SHA	Dec.
			°	°
7	Acamar	3.1	316	−40
5	Achernar	0.6	336	−57
30	Acrux	1.1	174	−63
19	Adhara	1.6	256	−29
10	Aldebaran	1.1	292	+16
32	Alioth	1.7	167	+56
34	Alkaid	1.9	154	+50
55	Al Na'ir	2.2	29	−47
15	Alnilam	1.8	276	− 1
25	Alphard	2.2	219	− 8
41	Alphecca	2.3	127	+27
1	Alpheratz	2.2	358	+29
51	Altair	0.9	63	+ 9
2	Ankaa	2.4	354	−43
42	Antares	1.2	113	−26
37	Arcturus	0.2	147	+19
43	Atria	1.9	109	−69
22	Avior	1.7	235	−59
13	Bellatrix	1.7	279	+ 6
16	Betelgeuse	0.1 to 1.2	272	+ 7
17	Canopus	−0.9	264	−53
12	Capella	0.2	282	+46
53	Deneb	1.3	50	+45
28	Denebola	2.2	183	+15
4	Diphda	2.2	350	−18
27	Dubhe	2.0	195	+62
14	Elnath	1.8	279	+29
47	Eltanin	2.4	91	+51
54	Enif	2.5	34	+10
56	Fomalhaut	1.3	16	−30
31	Gacrux	1.6	173	−57
29	Gienah	2.8	177	−17
35	Hadar	0.9	150	−60
6	Hamal	2.2	329	+23
48	Kaus Australis	2.0	85	−34
40	Kochab	2.2	137	+74
57	Markab	2.6	14	+15
8	Menkar	2.8	315	+ 4
36	Menkent	2.3	149	−36
24	Miaplacidus	1.8	222	−70
9	Mirfak	1.9	310	+50
50	Nunki	2.1	77	−26
52	Peacock	2.1	54	−57
21	Pollux	1.2	244	+28
20	Procyon	0.5	246	+ 5
46	Rasalhague	2.1	97	+13
26	Regulus	1.3	208	+12
11	Rigel	0.3	282	− 8
38	Rigil Kentaurus	0.1	141	−61
44	Sabik	2.6	103	−16
3	Schedar	2.5	350	+56
45	Shaula	1.7	97	−37
18	Sirius	−1.6	259	−17
33	Spica	1.2	159	−11
23	Suhail	2.2	223	−43
49	Vega	0.1	81	+39
39	Zubenelgenubi	2.9	138	−16